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Good Lighting

DO we really realise how big a part of our lifetime we have to spend without the light of the sun? On the average one spends nearly one-third of one's working hours in artificial light; there are fourteen years of darkness in the three-score years and ten which we are told is the normal span of human life, of which twenty years are spent in sleep—is it not worth while to make those hours of darkness more useful, more enjoyable, and more beautiful?

As its president has pointed out, that is just what the International Illumination Congress is striving to do. Meeting for the first time in this country, its main endeavour is the encouragement of the public to make use, scientifically, of more light, better light, in everyday life.

Elsewhere in this issue an account will be found of the doings of the Congress in Glasgow, where papers dealing with domestic lighting, daylight, photometry, and other subjects were read. In Edinburgh the session on public lighting, organised in conjunction with the Association of Public Lighting Engineers, evidently made the greatest appeal to delegates. The morning session was a crowded one, and the attendance during the afternoon (despite the counter-attraction of a trip to the Forth Bridge) was almost equally well attended. A feature which commanded general admiration was the manner in which Dr. N. A. Halbertsma presided, speaking three languages and, with humorous firmness, keeping speakers from various nations within the scheduled time. Both at Glasgow and at Edinburgh the conference has attracted much attention, and its proceedings have been well reported in the local Press, and so far the local weather seems to have joined in the general desire to give the members a good time. We feel sure that the Congress will result in many new international friendships, and we hope that at each of the centres visited it will kindle enthusiasm for good lighting and perhaps pave the way for the formation of local sections of the Illuminating Engineering Society.

At Sheffield and Buxton, where the next sessions are taking place, there is an exceptionally varied and interesting programme of papers, and foreign delegates will have further opportunities of seeing some of the finest scenery within the British Isles by day and more illuminations by night.

Misconception in some quarters calls for the reiteration of the fact that this September exhibition of floodlighting is being done without any charge on public funds; manufacturers, contractors, utility supply companies, both electrical and gas, are giving their equipment and their services because they feel it is good advertisement for their country and is good for our prestige and our trade—a form of salesmanship, or rather publicity, which is bound to improve and extend the many ways in which artificial light is used.

It certainly has been a great show. Londoners have not seen anything like it before, and many of the City's principal buildings have been revealed anew. But, though the floodlighting, wherever one has been able to get near it, has been delightful, the crowds and the traffic made the story. It has been a striking example of the power of publicity, and of the desire of the crowd to be interested and entertained.

Brighter London

ARE Londoners seeking a new form of night gaiety? The novelty of the spectacle alone could not have been responsible for the nightly invasion of floodlighting sightseers. Last week's immense object-lesson, coupled with the success of the various military tattoos and historical pageants earlier in the season, seems to point another explanation—the alacrity with which normal indoor amusements are abandoned whenever a chance is offered of being gregarious in the open air. London's public amusement gardens made social history; they were gayer by candle, oil-lamp, and gas light in those days than we are allowed to be in floodlight to-day. As the President of the Congress remarked in his broadcast talk, large sums of money are spent annually on maintaining public parks and gardens, the beauty and colour of which can be seen during the greater part of the year only within those hours when most people are at work and unable to enjoy them. By beautifying them during the evening hours of recreation we could add enormously to their value. Picture to yourself any town, or even village, that you know and think of some of its more attractive features made charming in this way; they may be mediæval or modern buildings, a landscape, or a combination of both. The darkest hour of the night will lose its foreboding and have a welcome attractiveness of its own. Even what in daytime may be dull and dirty may be transformed at night into a thing of beauty. This is not a suggestion for turning night into day, but rather of giving night an enhanced beauty of its own.

Preston Pot Fair

ON innumerable occasions in the past we have been able to show conclusively that fires attributed by the daily Press to electricity have been due to quite other causes. Last week a fire burnt out most of the stalls at Preston Pot Fair, doing damage to the extent of about £8,000, and several of our lay contemporaries were unable to refrain from ascribing it to "the fusing of an electric wire." Our investigations have once more proved the falsity of the statement; they have proved, beyond all doubt, that the fire was caused by children playing with matches. It is extraordinary, as well as unfortunate, that those journals which have often shown an enlightened interest in the development of electricity should go on automatically repeating so old a cliché that has so many times been discredited.

Oil-electric Railways

ALTHOUGH due attention was paid by the Weir Committee to possible alternatives to a system of main-line electrification in which electricity would be supplied from a centralised source, the magnitude of the issues involved warrants full discussion of every constructive criticism of the logical deductions from the Committee's report. The most important of those put forward relates to the substitution of oil-electric for steam locomotives. It is claimed that this method of improving our transport would cost very much less and, as it could be introduced gradually, would not commit us to an elaborate programme of reconstruction in the initial stages. The scheme should interest electrical engineers, as it involves the use of electricity on a large scale. We should welcome it if we did not believe the other scheme to be the better one. The tendency is everywhere to centralise generation, and the essential characteristic of railway electrification also is the removal of the generation of power from the train. Most of the advantages claimed for oil over steam traction apply to an even greater degree to centralised generation, and then there is the question of home-produced fuel. It is also doubtful whether the existing permanent-way could stand the strain of oil-electric locomotives of the size required under modern conditions, while the advantages of high acceleration, which accompany centralised generation, would be absent.

The Water-power Fallacy

THE reasoned statement of the supporters of the scheme for oil-electric traction recently laid before the Ministry of Transport was marred, according to a report appearing in *The Times*, by a claim for which we can see no grounds whatsoever. The claim is that the Diesel engine is steadily supplementing every other form of power except where natural resources of hydro-electric power exist. The fact is that the price quoted by the Central Electricity Board for railway electrification compares well with charges for electricity for the same service in countries dependent upon water power.

A Field for the Diesel

THERE are many branch lines throughout the country where the traffic density is so low that it would be difficult to make out a case for expenditure on the e.h.p. transmission lines, substations, and track equipment required for railway electrification as ordinarily understood. Here the merits of the Diesel-electric locomotive should certainly be considered for providing feeders for the main lines. The field thus presented is probably greater than is often supposed.

Power in Industry

THE information contained in the recently published Census of Production relating to the engineering trades has taken seven years to collect. In view of the rapid progress made in that period by electricity supply, much of the statistical data on the use of electric power in the industries covered is already out of date as regards detail. It is, nevertheless, easily possible by making reasonable adjustments to use the material as propaganda for hastening the marked tendency to change over to electrical operation. This can be supplemented by investigations of the undertakings themselves. In the United States surveys of the industrial power load and its potentialities within the area of supply of electricity undertakings are frequently carried out, with the result that the supplier is able to concentrate on outlets which had hitherto remained undisclosed, and thus increase considerably the load on the system. This in due course enables the undertakings to introduce lower tariffs for electricity required for lighting and domestic purposes.

Prepayment Meters

A LARGE public exists to-day whose slender financial resources have engrained in them the sound habit of "paying as they go." Without the use of prepayment meters it is difficult, if not impossible, to meet their electrical needs, yet there is still a number of fairly important undertakings which offer no prepayment tariff and confine their business to consumers who are able to meet quarterly accounts. Some engineers have had unhappy experiences with some of the early slotters," and are doubtless prejudiced thereby, but those experiences are now a matter of a quarter of a century ago, and for many years prepayment meters have been just as reliable as any other type. There are several modern instances in which the adoption of prepayment meters has led to a big increase in the number of consumers. We do not suggest that such meters should be used only to record consumptions for lighting. There is no reason why they should not be used in conjunction with all the other current-consuming devices that are now available.

Plug Points in Winnipeg

AN average annual consumption of 4,000 kWh per domestic consumer is reported from Winnipeg, where 55 per cent. cook and 40 per cent. heat their water by electricity. A large part of this development is ascribed by the *Electrical World* to the wholehearted support by contractors of the "red-seal" plan, resulting in an average of 75 outlets in each house wired under the scheme.

The International Illumination Congress

An account of the tour in Scotland, with brief notes on the technical subjects discussed at Glasgow

(By OUR SPECIAL COMMISSIONER)

THE good fortune which attended the opening day of the London session of the International Illumination Congress in part persisted on September 2nd when, although the weather during the early part of the day was deplorable, the evening was again fine, so that the tour of inspection of London "streets" and the visit to the Croydon aerodrome were carried out under pleasant conditions—and the crowds, if more manageable, were almost as great as on the opening night.

Looking back on the floodlighting arrangements, on which so much trouble was expended, no one can doubt that the effort was well worth while. Much of the work was excellently done, in view of the short time available for preparation. Probably many people would consider that the revealing of "feature" on Thames House, and the striking rose-illumination of Somerset House were most artistic pieces of work; other displays were, however, equally good if judged on the basis of fine results economically obtained. The colour-lighting of Arcadia House (cigarette factory) in alternating vivid red and green was striking, but admittedly was in a different class from the delicate and graceful impression of, for example, Thames House.

Glasgow Visit

The departure of the visitors for Glasgow at 1.15 p.m. on September 3rd was a well-staged event, and throughout the journey there was again evidence of the excellent "staff work" that has characterised this Congress. All needful data to smooth the path of visitors were distributed on the train, and on arrival they were met by the Reception Committee armed with distinctive banners, round which visitors rallied, and were marched away to their respective hotels.

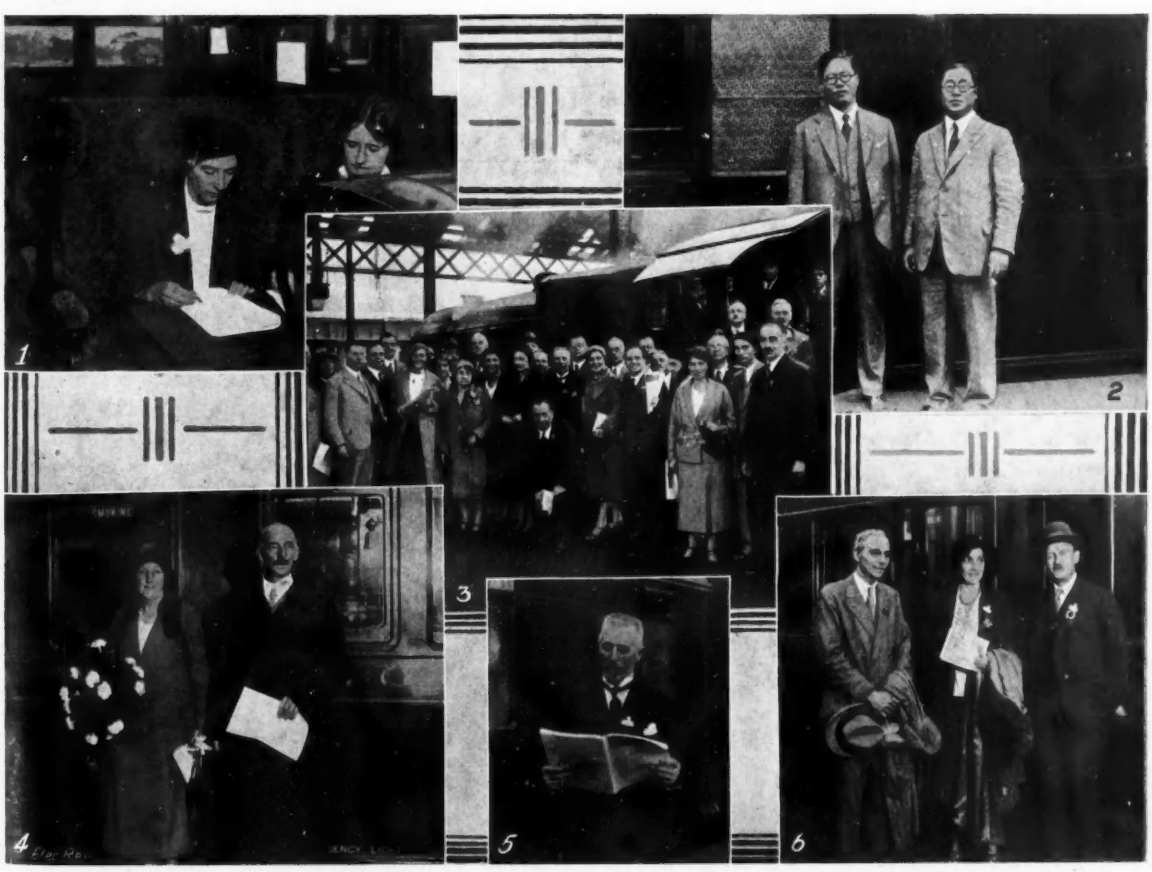
On Friday morning (September 4th) a civic welcome was extended to visitors at the Royal Technical College by the Lord Provost (Sir Thomas Kelly) who remarked on the importance of the common aims that had brought together delegates from so many different countries. He hoped that delegates would benefit from their gathering, and by seeing what had been done in Glasgow in connection with public and private lighting.

Mr. C. C. Paterson, President of the Congress, briefly responded, remarking on the desirability of punctuality. According to his calculations, the cost of the Congress worked out to between £12 to £15 a minute, so that every five minutes wasted was equivalent to a loss of over £50!

Papers Discussed

After these remarks had been interpreted in French and German, delegates profited by the president's admonition, and dispersed to the three simultaneous sessions, dealing, respectively, with "Lighting Developments," "Photometric Precision," and "Daylight." As there were twenty-seven distinct papers included under these three headings, it is naturally impossible to do more than give a general indication of their contents. The first paper on the list, by Miss C. Haslett and Miss Nora E. Miller, contained a plea for better lighting in the home. It was recalled that no fewer than fifteen million people in this country have defective sight. People will pay bills to the oculist and doctor without question, yet grudge the cost of adequate lighting, and give much more attention to furnishings than lighting equipment. Co-operation between the decorator and contractor is needed, and the field for developments in domestic lighting is a wide one.

Mr. C. W. Sully pointed out the great opportunities of electricity supply undertakings in educating the public to appreciate the need for better lighting. In recent years the growth of the lighting load has been greater than in any other section, and it is the most remunerative part of a public supply. Electricity supply undertakings should set up special lighting service departments, (i) to persuade existing consumers to use more adequate facilities, (ii) to insure that up-to-date lighting facilities are provided in all new lighting in-



Delegates photographed on Special Train to Scotland
(1) Cross-word Puzzle Enthusiasm. (2) Two Japanese Delegates. (3) Platform Group at Euston. (4) The President and Mrs. C. C. Paterson. (5) Mr. H. de le Paulle, with copy of the "Review." (6) Mr. P. Good, Miss A. Wiggins, and Mr. J. E. Ames

stallations, and (iii) to evolve and foster new uses of electric light in various spheres of application.

Mr. C. A. Atherton's paper on "Organisation for the Development of Electric Lighting" contained a striking and very complete summary (occupying 65 pages) of educational work in various countries and by various agencies. Specially interesting was the record of "national characteristics" as revealed by posters of different countries.

Mr. G. H. Stickney was responsible for a paper emphasising the importance of adequate wiring in relation to the plans of the illuminating engineer, and a complementary paper was submitted by Mr. G. S. Merrill on the effect of voltage drop on lighting schemes.

Sig. C. Clerici presented a paper reviewing progress in illuminating engineering in Italy during the period 1928-30. Besides illustrating typical developments in the lighting of shops, theatres, kinemas, etc., the author summarised educational work in Italy. A useful bibliography follows the paper.

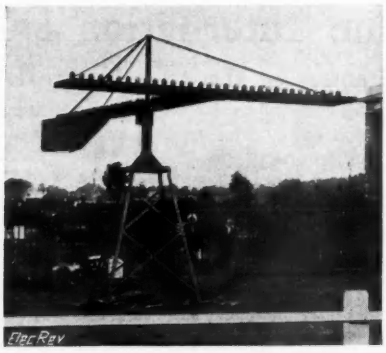
Lighting Precision

The nine papers presented in Section 2 (Photometry) dealt almost exclusively with accuracy and precision. A lengthy survey by the National Dutch Committee refers to the unsatisfactory agreement of the various photometric standards. Two main alternative standards based respectively on physical photometry and on a tungsten lamp of exactly known dimensions are suggested. The accuracy of practical photometry is also reviewed: a mean error of 1 per cent. for one setting is recorded. Mr. J. Hrdlicka reported a method of determining total error of photometric measurements by means of a frequency curve, and Messrs. E. Ferencz and J. Urbanek discussed various measurements on incandescent gasfilled lamps which are apt to show instability in candlepower (a simple method of overcoming this difficulty was explained by Mr. B. P. Dudding in the course of the discussion).

Other papers by Messrs. R. Kôvesligethy and P. Selényi, and by Mr. L. Simek, described experiments leading to average errors not exceeding 0.25 per cent. Papers by Messrs. A. K. Taylor and by J. Wetzel and A. Gouffé, respectively, dealt with the accuracy of portable photometers. The former indicated that the accuracy obtainable under service conditions is about 6 per cent., which, however, is increased to 13 per cent. if a filter is used. Finally reference should be made to a very comprehensive comparison by Messrs. B. P. Dudding and G. T. Winch of the accuracy of commercial photometry by visual and photoelectric methods. The results were ingeniously assembled in tabular form. It was shown that the latter method leads to a substantial diminution in error: the error in visual photometry consists of two approximately equal errors arising from slight inaccuracy in visual judgment and when carrying out voltage measurement.

Floodlighted Landing at London Air Port and 9-kW Projector

Three 1.5-kW Flood-lamps at Croydon



Wind Indicator at Croydon

Daylight Illumination

In Section 3 (Daylight) there were ten papers on the list. Of primary importance was Mr. P. J. Waldram's paper on "The Provision of Adequate Daylight in Building Regulations," which traced the development of legal aspects of natural lighting, and summarised the methods of treatment that have been developed in this country. The International Commission on Illumination has fixed a 5,000-lux (approximately 500 foot-candle) sky-brightness as normal. It is now suggested that a 0.2 per cent. daylight factor should be regarded as the minimum, corresponding thereto. Mr. A. C. Stevenson's paper was mainly mathematical, but Dr. H. G. Frühling's summary of recommendations made by the German Illuminating Engineering Society, Herr C. G. Möller's contribution on "Daylight Illumination and Town Planning," and Mr. T. Hirayama's notes on the lighting of art galleries were instructive.

Civic Receptions

Following the technical sessions there was a civic reception at the magnificent City Chambers in the evening, when addresses were given by the Lord Provost (Sir Thomas Kelly), Mr. C. C. Paterson (President of the Congress), Mr. H. de le Paulle (Belgium), and others. Music and dancing occupied the time until 10.30 p.m., after which a motor-tour of the streets of Edinburgh took place, with a view to studying the conditions of public lighting. Visitors were impressed by the uniform level of lighting throughout the considerable area traversed (which included extensive new housing schemes), but it was remarked that, in contrast with London, there was practically no floodlighting.

On the Saturday members started the day with a cruise down the Clyde, when they were favoured by sunny weather, so that the trip, which afforded excellent opportunities for members to meet each other, was a delightful experience.

At Edinburgh, where the visitors arrived on the evening of September 6th, after passing through Gleneagles, the chief topic of discussion was street lighting (Section I), which was arranged in conjunction with the Association of Public Lighting Engineers. In other sections Diffusing Materials (Section 2), Aviation Lighting (Section 3), and Physiological Problems were amongst the subjects discussed.

The presence of the delegates in Edinburgh particularly was signalised by some fine displays of floodlighting. Edinburgh had its historic castle and many of its famous buildings illuminated, and much attention was attracted. Aberdeen had also several notable displays, both the Town House and Marischal College being illuminated by the Corporation Electricity Department.

Croydon Aerodrome Lighting

The display of night flying and landing by the Royal Air Force, on September 2nd, at the London air port was much appreciated, the illumination apparatus installed at the aerodrome including the following:—

Location Beacon (CLAUDE-GENERAL NEON LIGHTS, LTD.), which consists of a steel framework tower, tapering towards the top, and on each side of the square are four tubes, 20 ft. long and 30 mm. in diameter, burning red. The tubes are operated by three 2.25-kVA transformers of 7,500 volts each, and the beacon is controlled by a push-button contactor from the control tower and is operated on a flashing code sequence, which can be adapted and used for signalling Morse code. The tubes are gassed to give a minimum luminosity of 18 candle power per foot run, and guaranteed to have a minimum life of 1,000 hours.

Delegates Watching an R.A.F. Night Flying Display at Croydon

Floodlights. (CHANCE BROTHERS & CO., LTD.).—This model embodies three 4th order 500-mm. diameter 120° lenses of dioptric type, using three 1½-kW special lamps. The three beams overlap, the total angle covered being 180°, whilst good illumination is still provided should one filament fail. Up to a range of 1,800 ft. the illumination is 0.15 ft. candle. Focusing is accomplished through sights, and the lamps and mirrors are given universal adjustment relative to the lens. The mounting upon two casters and one pivot enables the light to be slewed in the desired direction and dimming is provided to obviate dazzle when taxying, etc., and the beams can also be adjusted by a screw rise and fall on each lamp holder.

(GENERAL ELECTRIC CO., LTD.)—A new landing floodlight employs nine 1,000-watt tubular "Osram" horizon-type lamps arranged horizontally in three rows of three, one above the other, and there is a special type of silvered glass reflector behind each lamp. Each bank of three reflectors may be tilted individually, or all three may be moved together. It is thus possible to adjust the light distribution to the best advantage, and separate switches are provided for each lamp so that the power may be varied by steps of 1 kW from 0 up to 9 kW. Arrangements are made to prevent any upward glare from the floodlight and the vertical divergence is not more than about 4°. The horizontal spread is approximately 170°, and the isolux curve of equal illumination is nearly square in shape. Focusing is effected easily in daylight by a special optical jig which enables it to be done very accurately and easily. The beam candle power of the floodlight is over 600,000 candles, which is to be increased considerably by certain modifications.

Floodlight Beacon (CHANCE BROTHERS & CO., LTD.).—This consists of a dioptric 4th order lens with a diameter of 500 mm. in a suitable housing equipped with a 5-kW electric incandescent lamp, projecting 180 degrees in the horizontal plane, and having a narrow vertical divergence. When used as a flashing beacon the lens will be tilted upwards so that the centre of the beam has an elevation of 30 to 35°. The floodlight is then rotated about a vertical axis and exhibits to an observer at a distance characteristic short white flashes separated by longer dark intervals. The whole outfit with its electricity generator is mounted on a 4-wheel trailer.

Other apparatus on view included a Chance "ceiling light" for cloud illumination; Rotax aeroplane navigation lamps, generators, switchboards, etc.; and Chance and G.E.C. illuminated wind indicators.

Euston Station: Departure of Delegates for Glasgow and Edinburgh

American Street Railways

Recent returns indicate that conditions are similar to those obtaining in Great Britain and that they are due to like causes

WE are so accustomed to associate American public utilities—especially those of an electrical character—with abounding success that it is rather startling to learn of the unsatisfactory results achieved by street railways in that country. The latest official figures relate to the year 1927, and show that the total net income of these undertakings, which are comparable with our tramways and light railways, was, after payment of taxes, only 3.1 per cent. of their property investment.

Later figures are not expected to show any improvement, as they bring us into the period of industrial depression. Reviewing the period from 1902 to 1927, the main feature is that, while the route mileage, the number of car miles, and the number of passengers carried have steadily increased, there has been a still more rapid increase in operating expenses and taxes. Net revenue showed a moderate increase until 1922; thereafter it declined rapidly, together with the income available for interest and dividends.

In *The Guaranty Survey* for July, an effort is made to analyse the causes of "the almost uniform lack of success reported by the country's mass transportation agencies." Two factors are held to be mainly responsible: higher costs due to higher prices and wages, combined with the difficulty of obtaining commensurate advances in fares; and increasing competition from motor vehicles.

There are, however, other important elements at work. In the United States the electric street railways, like our tramways, were treated as monopolies which ought to be regulated in the public interest, and this desire for regulation expressed itself in the form of a demand for cheap transportation regardless of the prospect of financial return: "In growing cities, considerations of public welfare demand relief from congestion through the development of suburban areas; and the development of these areas in turn depends upon transportation facilities. Once these facilities are provided and the prices for their services established, the economic interests of the property owners within the area served become dependent on their continuance; and the political opposition to any project for the curtailment of service or the increase in rates is naturally very strong."

In addition, the companies are loaded with a number of extraneous burdens. "Operating expenses" include various imposts which are really in the nature of special taxes. The companies are compelled to pay the salaries of traffic policemen, to contribute substantial amounts to the upkeep of public parks, and—again as in Great Britain—to meet the cost of paving and maintaining road surfaces for the benefit of other traffic. It is estimated that imposts of these kinds take, in some cases, more than 60 per cent. of the net revenue.

Motor competition has made a material difference to many undertakings, but it does not appear to be so formidable or so intractable a feature as those just mentioned. In a few cases, but only a few, buses have virtually supplanted electric cars. More frequently the two agencies have operated together, either in competition or in a mutually supplementary relationship, sometimes under separate ownership, and sometimes under the ownership of the electric railway companies. Neither form of transport is expected to displace the other. The situation as our contemporary sees it is that "in crowded districts, where street space is at a premium, the electric car will probably remain indefinitely as the backbone of the transportation system. In outlying and surburban districts, on the other hand, buses will undoubtedly continue to figure very prominently, as they have in the last decade."

Various plans are being tried or discussed for relieving the street railways of the special disabilities under which they have been placed for public (i.e., political) reasons. Combinations of private ownership and public operation, or of public ownership and private operation; the assessing for transport purposes of property benefiting from the service; and the reduction of taxation, are the chief proposals. The solution most favoured by our contemporary is, however, the full disclosure of the situation to the public:—"An aggressive and intelligently conducted campaign of publicity, designed to bring about a more enlightened public opinion, seems to offer the most promising possibilities." Again, "in communities where the electric railways are really essential, intelligent co-operation between public officials and company managers should be able to place the utilities on a self-supporting basis. Where they are not, no conceivable set of operating conditions could enable the companies to make money."

Power in Industry

THE Final Report on the Third Census of Production of the United Kingdom (1924), relating to the Iron and Steel, the Engineering and the Non-ferrous Metal Trades, was published last week. (H.M. Stationery Office, 51-178-3. 7s. net.)

This volume is the third of a series, and relates to three groups of trades, viz.:—

(i) The Iron and Steel Trades.
(ii) The Engineering Trades.
(iii) The Non-ferrous Metals Trades.

It contains a separate report on each individual trade and, for each group of trades, a general report which brings together the results for all the trades which compose that group.

In each of these three general reports dealing with the above-mentioned groups of trades it is pointed out that the figures relating to power equipment afford an indication of the increase that has occurred in the use of electricity as a source of power, and also to the tendency to rely on electricity purchased from public supply undertakings rather than on the installation of generating plant in the works.

ANALYSIS OF POWER EQUIPMENT.

(Thousands of Horse-power.)

TRADE.	Electric motors driven by purchased electricity.	Electric motors driven by electricity generated in same works.	All electric motors.	Power other than electrical.	Total Power Equipments.	Power not supplied by electricity supply industry.
Iron and steel (blast furnaces)	25.1	84.5	109.6	180.4	290.0	264.9
Iron and steel (smelting, rolling, and founding)	458.2	472.0	930.2	1,198.4	2,128.6	1,670.4
Tinplate	4.6	11.3	15.9	86.7	102.6	98.0
Light castings	24.6	1.6	26.2	5.9	32.1	7.5
Wrought-iron and steel tube	68.9	15.3	84.2	16.9	101.1	32.2
Wire-drawing	55.2	16.5	71.7	23.3	95.0	39.8
Anchor, chain, nail, screw, and rivet	26.5	5.8	32.3	15.3	47.6	21.1
Hardware, hollow-ware, and bedsteads	38.8	2.3	41.1	14.4	55.5	16.7
Cutlery	8.4	0.6	9.0	4.1	13.1	4.7
Tool and implement	37.4	3.2	40.6	18.3	58.9	21.5
Blacksmithing	4.4	0.1	4.5	4.2	8.7	4.3
Needle, pin, fish-hook, and button	3.9	0.4	4.3	3.0	7.3	3.4
Small arms	2.9	0.0	2.9	0.3	3.2	0.3
Mechanical engineering	630.3	234.3	864.6	119.0	983.6	353.3
Electrical engineering	114.1	47.9	162.0	3.4	165.4	51.3
Shipbuilding	334.1	28.2	362.3	17.8	380.1	46.0
Motor, cycle, and aircraft	153.5	31.7	185.2	20.7	205.9	52.4
Railway carriage and wagon building	41.0	22.4	63.4	3.3	66.7	25.7
Copper and brass (smelting, rolling, and casting)	69.6	20.6	90.2	20.1	110.3	40.7
Lead, tin, zinc, and other metals	38.7	17.3	56.0	8.4	64.4	25.7
Gold and silver refining	5.0	0.0	5.0	0.3	5.3	0.3
Finished brass	16.3	1.6	17.9	9.3	27.2	10.9
Jewellery, gold, silver and electro-plate	15.2	0.3	15.5	5.4	20.9	5.7
Watch and clock	0.8	0.0	0.8	0.1	0.9	0.1
TOTAL	2,177.5	1,017.9	3,195.4	1,779.0	4,974.4	2,796.9

The Fourth Census of Production (1930), now in course of compilation, will undoubtedly show that this change-over from mechanical to electrical drive has continued.

In the meantime it is suggested that propaganda ought to be employed in order to assist in the completion of this change-over, and with this end in view we have brought together and analysed some of the figures from the volume just published.

In 1924 it will be seen that the Electricity Supply Industry did not supply half of the total power required for these trades.

It has recently been suggested that by the co-ordination of essential statistics bearing on electricity supply national standards are created by which local performance can be measured.

Communication Over Power Lines. By L. S. Crutch, B.Sc. (Eng.)

The need for a rapid and very reliable means of communication between stations is increasing in view of the modern tendency to link up different supply networks

THE term communication between stations also covers remote supervision and metering and the automatic transmission of the positions of circuit breakers and transformer taps as required. It may further include the handling of typewritten instructions and the conveyance of simple pictures such as circuit diagrams.

The methods by which this may be accomplished are as follows:—

A. By the hire of private wire circuits on the public telephone system.

B. By the installation of a private system, subject to the permission of the authorities concerned.

C. By the erection of telephone circuits on the same towers as the power lines.

D. By means of modulated high-frequency currents transmitted over the power lines themselves.

The choice of one or other of these methods depends mainly on three considerations:—

1. The speed with which connections between stations may be obtained.

2. The ability to obtain connections at any time and under all conditions.

3. The capital and maintenance cost of the installation.

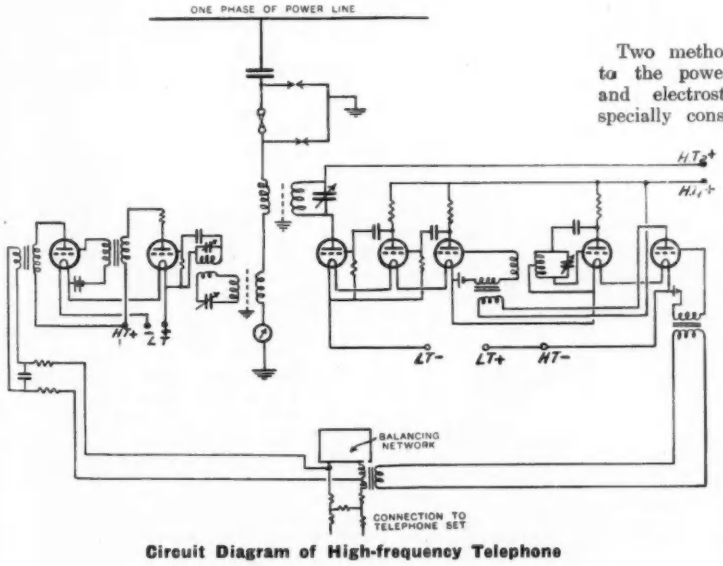
It is not intended here to attempt to compare the different methods of transmission, but a few observations may be of interest.

Method A involves very heavy rental charges over long distances, and, if overhead lines are used, is not absolutely reliable under all conditions. It is, however, the best method where the network is complicated and stations are close together.

The expense involved in the laying of a private cable circuit, as suggested in method B, would be very great and only justifiable under very special circumstances. The use of overhead lines is precluded on the ground of unreliability. Telephone circuits erected under the power lines themselves have been used in many parts, but special precautions have to be taken if freedom from personal danger and interference, both under normal working conditions, and (especially) in cases of breakdown, is to be ensured. This leaves the remaining method D, the high-frequency method, which is here described.

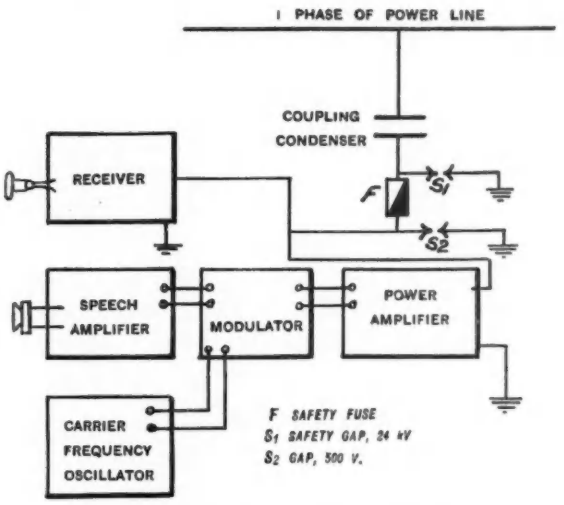
The High-frequency Telephone

The mode of transmission whereby an alternating current of high frequency is modulated by low-frequency currents, comprising speech or coded-signal impulses, does not require detailed explanation. In wireless, energy derived by this method is radiated in the form of æther waves in space, whereas in this form of communication it is propagated in the dielectric between the conductors of the line or between one line and earth.



Circuit Diagram of High-frequency Telephone

When the complex wave produced by modulation is applied to a rectifier at the receiving station, the original modulation frequencies are again produced and constitute the received signal. The apparatus required comprises a transmitter and receiver, which can be mounted together with the necessary switching and controlling apparatus in a vertical cabinet, as shown in the photograph on page 388. The transmitter is a valve oscillator which generates a carrier frequency, with a small power output of less than one watt. A speech amplifier strengthens the microphone output, and both carrier and voice inputs are applied to the modulator. The complex wave produced passes on to the power amplifier before being sent out on the line. Such a method, whilst needing more apparatus than a simple voice-modulated oscillator feeding the line, gives a much steadier output and does not produce such strong harmonics. The receiver is a simple rectifying valve circuit followed by a single stage of voice-frequency amplification. The valves used have a long life, and automatic alarms are provided to indicate any failure. Power is normally supplied by an accumulator battery driving a rotary convertor for anode current, and kept automatically charged. In large stations, where there are several sets, a motor generator supplies all needs.

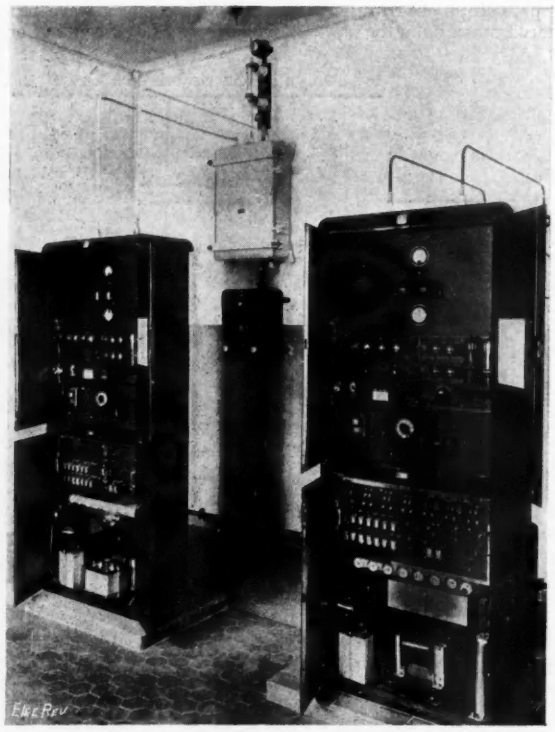


General Arrangement of Apparatus

Coupling to the Lines

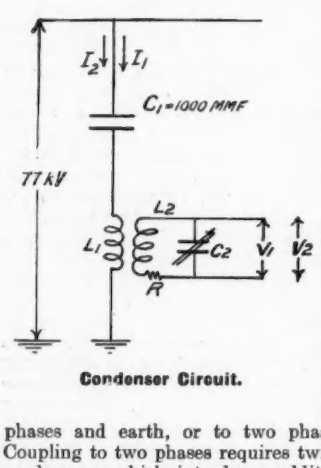
Two methods are available for coupling the equipment to the power lines; these are inductive aerial coupling and electrostatic coupling through a small condenser specially constructed to withstand the line voltage. Inductive coupling is not generally satisfactory, as the amount of coupling varies with weather conditions and the system has a high radiation resistance. The use of capacitative coupling is now fairly general, and special condensers are made having a porcelain dielectric which will safely stand 60 kV. For higher voltages a number of condensers are used in series. These condensers are tested to withstand twice the working pressure +20 per cent., and have so far given no trouble in service. The maximum value which can be made in a reasonable size is 1,000 mmF, but the actual value of coupling used may lie between 500 mmF and 1,000 mmF, according to the frequency used. These coupling condensers have some influence in determining the frequencies to be used on any system. The normal range of frequencies for carrier current telephony on telephone lines is from 8 to 40 kilocycles, but for power lines the size of condensers and reactance coils required for adequate coupling and operation puts the lower limit of frequency at about 40 kc, and frequencies up to 200 kc have been employed on very high voltage lines. It might be thought that even with small coupling condensers quite large power frequency voltages would be impressed on the receiver. The following calculations, based on the diagram over-leaf will show that this is not the case. This shows a normal e.h.p. line in which the voltage of each phase

to earth is about 77 kV. Let I_1 be the power line 50-cycle current, and V_1 the corresponding voltage produced across L_2; C_2 and similarly I_2 and V_2 are the corresponding high-frequency current and voltage. The circuits L_1C_1 and L_2C_2 both resonate at the carrier frequency used. In considering the 50-cycle current, the reactance of L_1 may be neglected in comparison with that of C_1. The reactance of 1,000 mmF at 50 cycles is $\frac{10^{12}}{2\pi \times 50 \times 10^3}$ ohms, which is 31.8 megohms. Thus the current I_1 is 2.42 milliamperes. The inductance of L_1 and L_2 is about 0.001 Henry, so that the voltage induced into L_2C_2



Transmitter and Receiver Unit

(acting as the open secondary of a unity ratio transformer having a coefficient of coupling K=0.05) will be $K\omega L_1 I_1$, or 0.0000380 volts, which is quite negligible. The case of the carrier-frequency current is quite different. If it is assumed that 2 milliamperes in the line is sufficient to work the apparatus, then the voltage produced across I_1 will be WL_1I_2, which is 1.256 volts if the carrier frequency be taken as 100,000 cycles. Furthermore, since the circuit L_2C_2 resonates at 100 kc., the effective voltage produced across L_2C_2 is given by $\frac{K\omega_c^2 L_1 L_2 I_2}{R}$, where



Condenser Circuit.

R is the effective resistance of the circuit; this is 1.31 volts if R is 30 ohms. It will thus be seen that the carrier-frequency voltage is many hundreds of times greater than the interfering voltage, which is quite negligible in comparison with it, and, further, taking into account the square law characteristics of the rectifier, the interference will be quite inaudible.

Transmission over the power network can be made either by coupling to one phase and earth, two phases and earth, or to two phases (inter-phase coupling). Coupling to two phases requires twice the number of coupling condensers, which introduces additional expense, but on the other hand the line attenuation of a single-phase system is about three times that of the inter-phase system. This is not very important, as it is quite easy to use increased power. The inter-phase method is open to twice the chance of interruption in case of breakdown, but in the event of one phase only breaking down, the single-phase earth system can be resorted to if the power is increased. The effect of hoar frost and snow on the lines is more marked on the inter-phase system than the single-phase, but the difference is not of much practical account. The various advantages and disadvantages, however, when summed up, are of little practical importance on lines less than about 75 miles long, and the extra cost of coupling condensers and rejectors make single-phase working desirable. It has been found quite reliable in the majority of cases.

Principles of Transmission

The power lines provide a very efficient medium of transmission, in fact much more efficient than any telephone line which it would be economical to erect. The theoretical aspect of this transmission can be treated by the application of the same principles as for line telephony, with one or two practical modifications. The line resistance is so small in comparison with its reactance at the high frequency, and the insulation is so good, that the leakage is also negligible in comparison with the reactance, and the expressions for the line attenuation and impedance can, therefore, be considerably simplified. Calculations of line attenuation on systems using an earth return are complicated by the uncertain factor of the effe tive earth resistance, so that for the sake of simplicity the following remarks refer to an inter-phase system. The inductance and capacity of any two wires of a symmetrical three-phase system can be calculated in accordance with well-known formulæ; as an example, it may be stated that a line composed of 7 strands of conductor of 0.161 in. diameter per strand, and at a spacing of 12 ft., has an inductance of approximately 0.0021 Henry, and a capacity of 0.014 microfarad, both per loop mile. The characteristic impedance of the line is given by $Zo = \sqrt{\frac{R+j\omega L}{S+j\omega C}}$, where R, L, C, and S are the usual constants; this simplifies to $Zo = \sqrt{\frac{L}{C}}$, and for such a system is about 380 ohms. The simplified formula for the attenuation constant is $\beta = \frac{R}{2}\sqrt{\frac{C}{L}} + \frac{S}{2}\sqrt{\frac{L}{C}}$, and it is necessary to make some assumptions here. If S can be neglected in comparison with the other factors, we then have $\beta = \frac{R}{2}\sqrt{\frac{C}{L}}$, where R is the effective loop resistance at the particular frequency involved. This is a matter of some difficulty as it depends on the state of the conductor surface. The d.c. resistance of this type of conductor is about 0.45 ohms per loop mile. Allowing a factor of 5 for skin and eddy current effects we have

$$\beta = 2.5 \times 0.45 \frac{.014 \times 10^{-6}}{.0021} = 0.0026 \text{ neper}$$

per mile = 0.022 decibel per mile.

It will be seen that in neglecting the leakage no account of weather conditions is being taken. The effect of wet weather is to lower the insulation and so increase the attenuation. The variations which occur with changes of weather are unimportant, except on very long lines. The figure of 0.022 decibel per mile compares very favourably with that of 0.04 per mile for the heaviest aerial telephone lines in use and 0.19 decibel per mile for a 40 lb. loaded underground cable at voice frequencies.

Coupling Condenser

Methods of Trading in British Malaya.

H.M. Trade Commissioner at Singapore (Mr. R. Boulter) has prepared a memorandum on methods of trading, terms of payment, appointment of agents, buying seasons, etc., in British Malaya. Copies of the memorandum, together with particulars of the Department's special register service for the supply of commercial information, may be obtained by United Kingdom manufacturers and exporters, on application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1, quoting reference number C.X. 3635.

Mr. R. W. Boulter is at present in the United Kingdom, and will be available for the purpose of interviewing firms interested in trade with British Malaya at the Department of Overseas Trade and at certain provincial centres, for a short period from October 5th next. Firms desirous of meeting Mr. Boulter should apply to the Department, quoting reference No. 2361/1/31.

Electrifying Rural England.

By R. Alan Thwaites, M.Inst.C.E., M.I.E.E.

Progress will depend upon the use of overhead lines, acceptable tariffs and suitable apparatus

THE problem of satisfying the need for electricity in rural districts is largely a matter of finance, and special technical problems only arise by virtue of the necessity for exercising the utmost economy in the expenditure of capital. Only thus is it possible to serve rural communities at prices they can afford to pay.

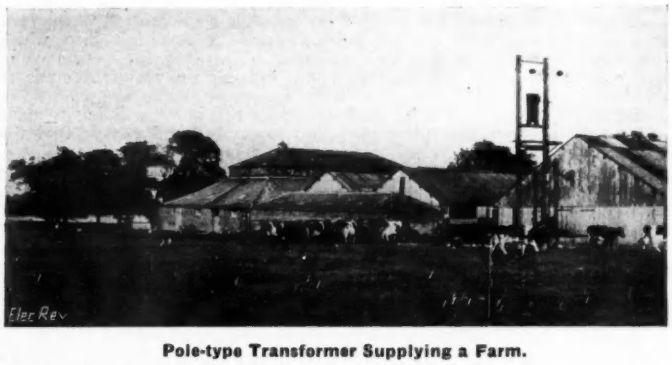
It is regrettable to have to record that the ever-increasing burden of local rates is proving a serious obstacle, and has already since 1926 more than offset the most optimistic estimates of the economies likely to accrue from the operation of the "Grid."

Hitherto in this country rural electrification has in the main only been carried out successfully by large existing organisations having sufficient financial resources to carry them over the early unprofitable years of supplying thinly populated districts. Development is steadily taking place along these lines in many districts, and one supply undertaking in the North Midlands already has some 32,000 consumers in rural districts. In certain areas, however, progress is less satisfactory.

Two Demonstration Schemes

It was with a view to accelerating matters that the Government decided about a year ago to make experiments in Bedfordshire and Norfolk, in which the respective undertakings are to be helped to bear the capital charges in the early years.

Such an arrangement, if extended to other rural areas, would enable development to be carried out more rapidly than would otherwise be possible, and would help not only the country districts, but would find immediate employment for a large number of men, both in the provision of mains and equipment, and in the wiring of premises and the manufacture of apparatus. In Table I a comparative analysis of the two Demonstration Schemes is set out.



Pole-type Transformer Supplying a Farm.

It will be noted that in the case of the Bedfordshire Scheme the rate of development is assumed to be unusually rapid, the justification being that in many cases entire villages are being wired by the landlords. Those responsible for the scheme estimate that it will be on a remunerative basis "after a few years." The Norwich Scheme is expected to be self-supporting after the seventh year of operation.

Use of Overhead Lines

Certain statements have appeared in the daily and weekly press to the effect that, in the Bedfordshire Demonstration Scheme, underground cables have been adopted because their cost is no greater than that of overhead lines.

This is a mis-statement of fact, but use has so frequently been made of it by those opposing the erection of overhead lines that the Electricity Commissioners issued a Memorandum dated 25th March, 1931, on the subject, in which they pointed out that the returns rendered to the Commissioners by upwards of 200 electricity undertakings of the capital expenditure actually incurred on the low voltage distribution lines and cables in their rural areas showed that the average cost per mile of underground low voltage cables was more than 100 per cent. greater than in the case of overhead lines. The Memorandum goes on to emphasise the necessity for the widespread use of overhead distribution in rural areas.

Low-voltage Line and Overhead Service

It has recently been pointed out with considerable truth that it is usually the manner in which things are done, rather than the fact that they are done, that is to be criticised, and it behoves all who are in any way responsible for the design or placing of overhead lines to take all reasonable precautions to ensure that their appearance is as unobtrusive as possible. Hence the design of masts and brackets should be simple in character. A straight run is less distracting than zig-zags, and in hilly country an endeavour should be made to select such a route that travellers do not see the masts above the sky-line.

These last two conditions are subject to the wishes of the owners and occupiers of the land, who generally appreciate the point, once it has been put to them. The local rambling club and other similar institutions are usually only too pleased to co-operate, and to use their local influence, which is often considerable. Incidentally, the engineer obtains his reward because these two conditions usually make for a satisfactory line from the point of view of construction and operation.

With regard to colour, insulators should be brown (why does the P.M.G. so love white?). Experience has shown (contrary to expectation) that even where green predominates in the scenery, grey or sage green for the ironwork merges into the background in open country far better than if an endeavour is made to match the green of grass and leaves.

Importance of an Attractive Tariff

It is now generally recognised that if electricity is to be used merely for lighting, it is unlikely that the required revenue will be obtained, and every effort must be made to encourage the use of electricity for other purposes.

This calls for an attractive tariff. The form most favoured for dwelling-houses is a two-part tariff, in which the standing charge is based on some factor related to the maximum demand likely to be created, such as the rateable value of the premises,

A 10-KV. Rural Transmission Line Crossing Canal

the number of rooms, or the size of the premises. This is coupled with a running charge of the order of 1d. to 1½d. per kWh.

The Committee appointed by the Electricity Commissioners to look into the question of the Uniformity of Electricity Charges and Tariffs expressed themselves in their Report of last year in favour of employing the dimensions of the house as the basis of the fixed charge, but this system has not so far received any large measure of support.

The Effect of Thermal Storage

The heating of water on the thermal storage system is now in more extensive use, and at least one electric cooker of English make incorporating this system has been placed on the market. It must not be overlooked, however, that while with the ordinary type of cooker or a highly loaded water heater a diversity of, say, 5 : 1 may be expected, thermal storage apparatus of the lightly loaded type results in a much lower diversity, and at the limit when continuous loading is employed the diversity is nil.

The saving on transmission mains is therefore considerably less than might at first be supposed, and there is the disadvantage that in certain classes of thermal storage apparatus (notably the thermal storage cooker) the consumption of energy is greater than that of the normal type having the usual high rating. This is a disadvantage.

TABLE I.

COMPARISON BETWEEN BEDFORD AND NORWICH DEMONSTRATION SCHEMES (1921 CENSUS FIGURES).

	Bedford.		Norwich.	
	Second Year	Third Year	Second Year	Third Year
Population	15,862	15,862	14,166	14,166
Area (acres)	64,849	64,849	80,000	80,000
Persons per acre	0.24	0.24	0.18	0.18
Number of dwellings	4,038	4,038	3,588	3,588
Number of consumers	2,221	2,624	1,100	2,000
Capital expenditure, £	106,000	110,000	*48,000	*54,000
Capital expenditure per consumer	£48	£42	£43	£27
Revenue, £	13,800	17,200	3,500	7,000
% Rev. : Capital	13%	15.5%	7.3%	13%
KWh sold	1,380,000	1,720,000	280,000	560,000
Av. price per KWh (pence)	2.4	2.4	2.4	2.4
Revenue per consumer, £	6.3	6.5	3.2	3.5
Revenue per head	17s. 6d.	21s. 8d.	5s.	10s.
KWh sold per head of population	87	108	20	40
KWh sold per consumer	620	650	255	280
L.V. distribution (yards)	79,000	79,000	70,000	70,000
L.V. distribution per consumer (yards)	36	30	63	35

* Excludes an existing main through the area.

High-torque Motors

A HIGH-TORQUE motor is an alternating-current machine which will give for short periods a very much higher torque than that required for full load. Such torques, in practice, usually occur during starting, when friction and inertia of moving parts have to be overcome. The choice of an alternating-current motor suitable for any duty is almost entirely governed by the question of starting torque and the current allowance on the system of supply at starting.

The standard squirrel-cage induction motor has a maximum capacity of never less than twice full-load torque on overload, but the torque is much smaller in starting. Figures of four and even five times full-load torque on overload are often met with in ordinary machines, but such machines cannot be classed as special heavy-torque motors, unless the torque available at start is also high.

There is no doubt that there is a very large field for the double-wound induction motor, which sacrifices the very large overload of the standard motor for increased starting torque. This compromise is very satisfactory in practice, as the heavy overloads possible with a standard induction motor are hardly ever used, and the increased starting torque is of the utmost importance. The starting torque can be increased to a large figure by suitable design. In practice it is possible to make an induction motor which will give 73 per cent. of the full-load torque on the star position with one and a half times full-load current; with an auto-transformer starter this machine would give 40 per cent. more than full-load torque with less than three times full-load current. The former figures are very good indeed and should satisfy many requirements which are met at present with the more expensive slip-ring equipment. A motor of this type is capable of about 25 per cent. overload.

The circle diagram of the double-wound machine is not easily predetermined, owing to the methods of induction-motor design, which are adapted to a combination of one rotor winding with one stator winding. The two rotor windings are, in effect, equivalent to one resultant winding. It is usual in practice to plot two circles, one for each winding, and to use a little enlightened guess-work to discover the points representing full threequarter and half-load for the double rotor. This process is more accurate than it sounds, as the two circles are fairly close together round about the normal load points. This method avoids one pitfall into which designers sometimes fall—that of making the resistance of the outer winding too great, causing the resultant circle to be nearer the smaller circle, and consequently the overload to be too small. If the overload of the inner winding is made 10 per cent. more than full load, this will ensure that the resultant overload is more than this figure.

Test figures for these machines show higher rotor temperatures than those calculated. This is due to the difficulty referred to before—of evaluating separately the reactance of each of the rotor windings. The current to balance the stator turns on load divides itself up between the outer and inner windings, not in proportion to the total calculated resistance, but in proportion to the total impedance of each winding. As the impedance of the inner winding at full load is considerably greater than its resistance, more current passes through the outer winding, causing a greater loss.

In appearance these motors are like ordinary squirrel-cage machines and are usually of the same size and the same mechanical proportions, but they are slightly more expensive to manufacture. Machines of this construction are suitable for all purposes and can replace slip-ring machines in every instance where the supply authority will allow the relatively high starting current.—D. S. SANDEMAN.

Oil-electric Traction

FURTHER particulars of the proposals for the electrification of the main lines of the British railways on the oil-electric system, recently laid before the Ministry of Transport, have been given in *The Times*.

The technical advantages claimed for the system are as follows :—

(1) The high thermal efficiency of the Diesel locomotive (27 per cent.) as compared with that of the electric tractor (13 per cent. effective) and of the steam locomotive (7 per cent.).

(2) A simplified fuel supply due to oil being less bulky than coal.

(3) Operation of trains either as single or multiple units by one man from either end.

(4) Elimination of electric track and overhead equipment, thus obviating risk of shock.

(5) Availability for 24-hour service if necessary. Effective earning hours compare with steam in the ratio of at least 3 to 2.

(6) Possibility of operation in conjunction with either steam or electric services. Oil-electric sets can be introduced gradually without dislocation of existing system.

(7) Improvements in design can be taken advantage of without scrapping any of the original capital outlay.

From the financial point of view a complete scheme of oil-electric working would, it is estimated, cost £154,000,000, giving an overall yield of 14.85 per cent.

A writer in *The Financial Times* states that the mere substitution of oil-electric locomotives offers no advantages in railway operation, in acceleration of transport, or in the elimination of fumes. The system of fuel supply would also be very much more complicated than at present. Although the oil-engine locomotive would be much more efficient than the steam locomotive, the ratio of oil prices to coal prices would have to be less than 20 to 8 to justify the change on grounds of fuel economy. The present price of Diesel fuel is £4 2s. 6d. per ton, and of coal for power station and railway operation between 13s. and 14s. per ton, which (allowing for differences in calorific value) gives a ratio of 20 to 9. This margin would be too narrow and also too temporary in character to justify the change-over to the oil-electric system.

No full test data over a satisfactory period of time are available, and the highest capacities in service are not in excess of 1,000 h.p. It is extremely doubtful whether the permanent way could take the weight of a Diesel-electric unit of 2,000 to 3,000 h.p., such as would be required to compete with an electric tractor; a unit of 6,000 h.p., such as the Swiss railways have in commission for electric haulage, would be impossible for oil-engine operation. The cost of maintenance, especially on the track, would be formidable with the latter.

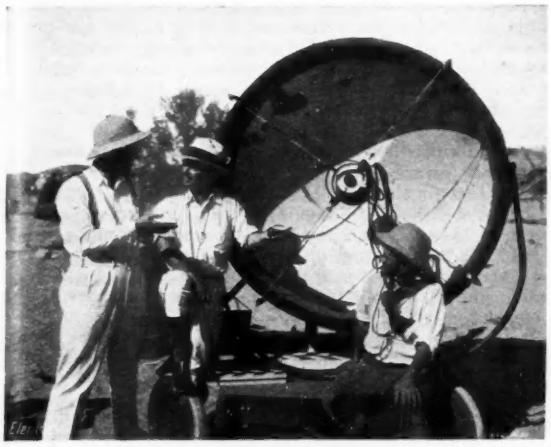
The estimates of capital expenditure for oil-electric operation make no allowance for the costly and elaborate distribution system needed to make fuel supplies everywhere available.

The Ribbon Microphone. By Gordon S. Mitchell

An innovation of considerable importance in talking picture recording

ONE of the most pressing needs encountered in the recording of sound for motion pictures has been a microphone (of sufficient sensitivity) which would not pick up the myriad unwanted sounds from its immediate vicinity in addition to the desired sounds which are to be recorded.

The problem was first attacked from the standpoint of a reflector, or concentrator, which would enable the microphone to be focussed much as light is focussed, and would exclude



Reflector Microphone

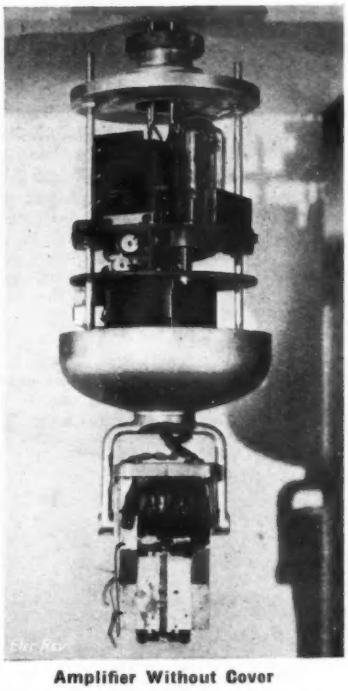
all noise outside of the "sound beam." This assembly found rather wide use for a time, but now the R.C.A. Photophone Corporation of Hollywood has perfected a "ribbon microphone" which operates according to the principle that an electrical conductor moving in a magnetic field has an electromotive force induced in it by its action in cutting the magnetic lines of force of the field. At any instant the induced e.m.f. is equal to the rate of change of the magnetic flux multiplied by a constant, which is the basic principle upon which most electrical machinery depends for operation.

There is one fundamental difference between the ribbon microphone and analogous electrical devices. Whereas larger machines have many conductors which move through the field of force, the ribbon microphone has only one conductor; hence the magnetic field must be of great strength in order that

Ribbon Microphone

a small movement of the ribbon will result in a consequent appreciable change in the generated current. A small, but powerful, electromagnet provides this relatively strong field.

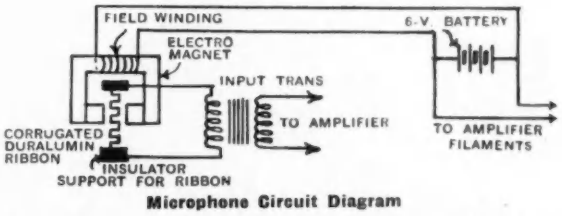
A very wide piece of flat metallic ribbon is used for the moving portion of the microphone, mainly because it presents a greater surface for the sound pressure waves to strike against. The ribbon is suspended loosely directly between the two poles of the electromagnet, transversely to the field of force. When a sound wave, which is made up of alternate condensations and rarefactions of the air strata, impinges upon the flat surface of the ribbon the latter moves backward and forward due to the changes of pressure. This movement of the ribbon in the field of force causes a minute alternating current to be set up in the ribbon due to the cutting of the lines of force, which minute current is fed to the grid of the first amplifier valve through an input transformer. Since the movement of the ribbon depends entirely upon the frequency of the air condensations and rarefactions, the frequency of the induced current is the same as the frequency of the sound waves causing the movement. Similarly, the greater the amplitude of the sound wave the greater is the distance through which the ribbon travels and the greater number of lines cut, hence the greater is the induced e.m.f. After being suitably amplified, this current can be transmitted to the sound recorder, radio broadcast transmitter, or to whenever an exact electrical counterpart of the generating sound wave is desired.



Amplifier Without Cover

The light metallic ribbon is made of duralumin, approximately three inches long, three-sixteenths inch wide, and one half mil thick. To prevent the formation of "standing" waves, and to keep the natural frequency of the ribbon out of the frequency range that is normally recorded, the ribbon is corrugated transversely and it is supported without tension by two small insulators, one at each end. It is enclosed in an aluminium case, which is perforated to allow free entrance for the sound waves. A U-shaped core is use for the electromagnet with the two poles quite close to the ribbon edges. The field winding is placed about the lower part of the "U" and is energised by a six-volt storage battery, which can also be used to furnish filament current for the amplifier valves.

As used normally, the microphone (which can be seen in the accompanying illustrations as a small oblong box at the end of the cylinder) and its associated amplifier (contained in the cylinder) are placed in recording position as a unit, but it is oftentimes desirable to conceal the microphone and so a special transformer has been designed which will allow the microphone to be operated at a considerable distance from its associated amplifier. The impedance of the line used is so low that a considerable distance may be traversed without picking up extraneous electrical disturbance.



Microphone Circuit Diagram

The ribbon will respond to sound waves emanating from only two general directions, normal to the face of the ribbon. If sounds strike the surface of the ribbon from an angle, the response will vary according to the size of that angle. Sounds originating in a plane parallel to the face of the ribbon will have no effect upon it at all, that plane being known as the plane of "zero reception."

Camera noise, generator noise, and other noises which, although extraneous, are impossible of eradication entirely upon a motion-picture set, may be entirely eliminated from the recording by the proper orientation of the microphone.

E

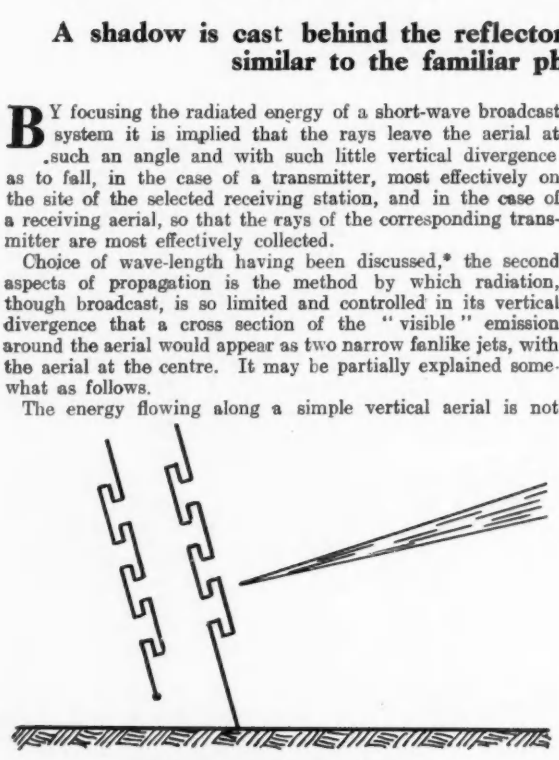
Focusing Short Radio Waves. By N. Wells, M.Sc.

A shadow is cast behind the reflector and energy radiation is doubled in front similar to the familiar phenomenon of light reflection

BY focusing the radiated energy of a short-wave broadcast system it is implied that the rays leave the aerial at such an angle and with such little vertical divergence as to fall, in the case of a transmitter, most effectively on the site of the selected receiving station, and in the case of a receiving aerial, so that the rays of the corresponding transmitter are most effectively collected.

Choice of wave-length having been discussed,* the second aspects of propagation is the method by which radiation, though broadcast, is so limited and controlled in its vertical divergence that a cross section of the "visible" emission around the aerial would appear as two narrow fanlike jets, with the aerial at the centre. It may be partially explained somewhat as follows.

The energy flowing along a simple vertical aerial is not



"Uniform" Aerial Representation

confined to the conducting wire; in fact, a quick glance, but not a steady stare, would reveal it in the form of waves along the wire possessing the peculiarity that alternate waves are of different hue, let us say red and blue; the red shall be called positive and the blue negative. These waves do not travel along the wire, being termed "standing waves"; nevertheless, they possess a rapidly-rotating motion with the wire as the axis, the positive waves rotating in one sense and the negative waves in the opposite sense. The total effect is that a stream of radio energy is broadcast from the aerial at an angle inclined to the earth's surface, and our problem is to ensure that the angle will be such that the far end of the stream will fall with the greatest concentration at the particular radial distance (assume it to be 4,000 miles) where the receiving station is situated.

At the outset we are confronted with two clashing interests, for in order to prevent undue ground absorption of the radiated energy it is necessary to make the aerial high and yet, for reasons known to mathematicians, who are occasionally right, we will find that the higher we make the aerial the greater the inclination from the earth at which the main stream of energy leaves the aerial.

A slow-motion view of the waves around the wire would reveal them rising to full amplitude and falling to nothing with perfect rhythm, changing their direction of rotation in between falling and rising; in other words, if at any instant the waves starting from the base alternate blue and red, at the next instant they will alternate red and blue. Were it possible to put a box round every alternate wave, exposing only waves of one colour, we would find an immediate control of the upward slope of radiation and the energy could be broadcast at quite a low angle. It has been previously mentioned that the dimensions of short-waves play an important part in the evolution of the aerial, simply because it is practical to design masts and run wires several times the length of waves that are only a few metres long, whereas with waves of the order of, say, 14,000 metres it is hopeless to consider the proposition. The problem, then, of designing aerials for short-wave working is considerably facilitated and, though it is not practical actually to box up parts of the aerial, it is quite possible to do so in effect and to suppress alternate waves by cunningly bending back on itself that portion of the wire carrying the unwanted wave (for simplicity we have referred to one hump as a "wave," whereas, to be accurate, the two humps, one of which is really a hollow, constitute the complete radio-frequency wave).

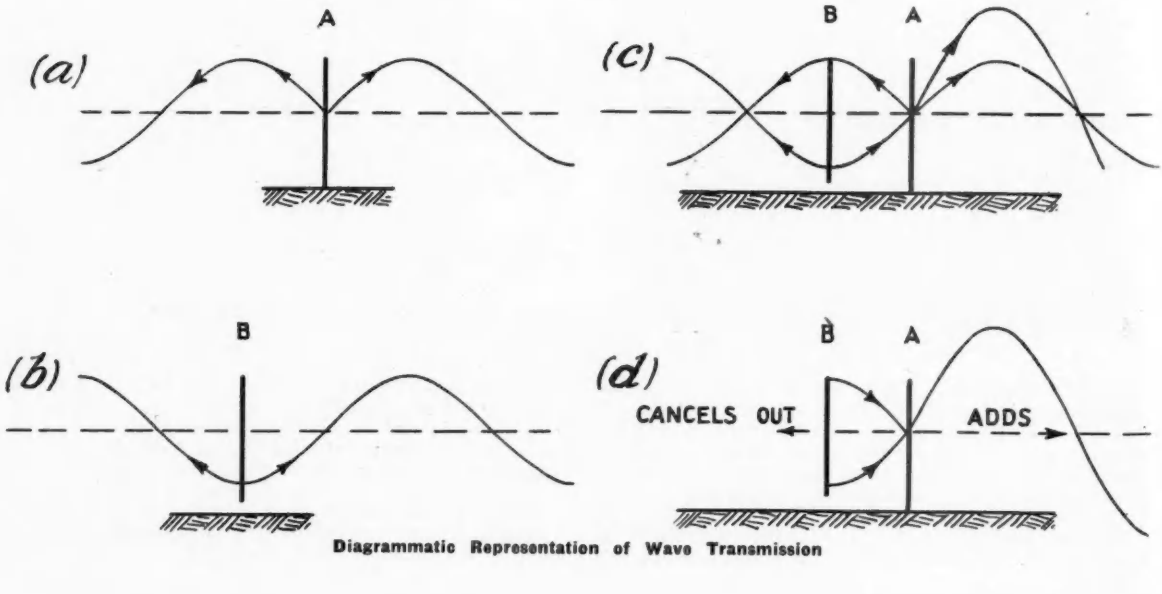
A further development is known as the "Marconi Uniform" aerial, which tends to smooth out the humps and hollows of the "standing" waves, thereby lessening the diffusion of energy and concentrating it between the narrow limits indicated by the adjacent diagram. The actual control of the upward tilt of propagation depends on the relative dimensions between the various elements of a complete uniform aerial and, incidentally, a certain amount of additional control may be achieved by tilting the aerial; in the latter case it is preferable to couple the aerial to a reflector, as this has the advantage of preventing the absorption of the downward slanting rays by the earth's surface, since they will then be reflected backwards and upwards and combine usefully with the rays propagated towards the receiving station.

Let us recapitulate the reasons for using high aerials:—

(i) By raising the centre of radiation above the earth's surface the energy in the aerial is made effective for radiation; that is, with low aerials a large proportion of the energy is lost in ground absorption, and may reach the surprising figure of 80 per cent. for a simple half-wave aerial with its base near the ground, but the efficiency rapidly improves as the height above ground increases. Thus, when a vertical aerial has an overall height of two wave-lengths its centre of radiation may be taken as from one to one-and-a-half wavelengths high, depending on the design, the efficiency being from 70 to 90 per cent. useful radiation of the total power input.

(ii) Raising the height of the aerial permits, with careful design, concentration of the energy propagated, which is very advantageous because not only is there an effective gain in

* See ELEC. REV., July 17th, 1931.



Diagrammatic Representation of Wave Transmission

useful power output, but the elimination of high-angle radiation reduces the tendency for out-of-phase, or "image," signals to reach the receiving station.

(iii) Raising the height gives a certain control of the mean angle of propagation and, as must be evident from the diagram, there must be some definite angle at which, for any given distance, propagation is most effective. There should be no confusion on this point and it may be necessary to emphasise that strength of radiation has little, or no, effect on the "trajectory" of the waves, which will follow, to all intents and purposes, the same path whether ten watts or 100 kilowatts are radiated.

What takes place around the aerial is not known, but in some fundamental way during the ebb and flow of the "standing waves" there is a mysterious transfer of energy and radio waves are flipped off into the ethereal ocean, travelling away with the velocity of light in widening billows. However, what takes place under certain conditions a few paces away from the aerial? Suppose aerial A to be arranged to be energised by some radio transmitter, which need not be considered, and a second exactly similar aerial B, which is not directly energised and may be insulated from the ground. Suppose the distance between A and B to be exactly one quarter of the wavelength radiated by A, the "wave" now referred to being the complete hump and hollow as above-mentioned. If we draw a plain curve above a dotted horizontal line to depict the positive hump, or half-wave, a continuation of this curve below the line will serve to depict the negative hollow, or half-wave.

Now at (*a*) waves are leaving the aerial A, hence B will be excited by the energy flowing past it and start oscillating, drawing the necessary energy from A. There is, however, a subtle difference in the behaviour of B, namely, that when, say, a positive wave crest impinges on it from A at that precise instant a negative wave crest, or hollow, is rushing off it. At (*b*) the waves are depicted leaving B, while (*c*) shows the combination of (*a*) and (*b*) from which it is clear that the summation of the two waves in the direction BA is to add in front of A, whereas the effect is to neutralise each other in the direction behind B.

One factor, important to the correct understanding of the principle, may be noted. Taking B as a centre, the waves from B travel to right and left, while the waves from A impinge on B and travel on in the same direction on both sides of B. Similarly, taking A as the centre of observation, the waves from B travel in one direction in respect of A, while its own waves travel to right and left of it. For simplicity we have confined our investigation to what occurs along the direction immediately in front of A and immediately behind B.

In dealing with reflection it is obvious that we can no longer call the aerial a broadcaster, since its radiation is not effective over a fairly wide angle in the rear of the system.

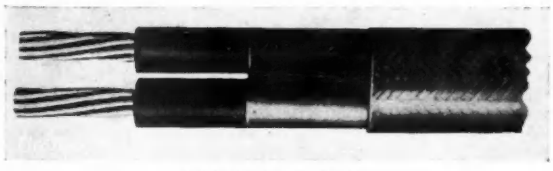
With reference to the relationship between the waves, B behaves as a freely-oscillating coupled circuit and follows Faraday's laws of induction, but calculations of the precise phase relationship between the impinging A wave and the wave radiated by B are difficult, since the radiation resistance of B depends on the proximity of the earth as well as the proximity of A. Within reasonable limits, however, the above simple explanation of reflection may be accepted as representing the probable principle underlying the experimentally ascertained fact.

A Sub-distribution System

Not Requiring Earthing or Continuity Devices

A RECENT development and introduction of Callender's Cable and Construction Co., Ltd., is a sub-distribution system which can be used in conjunction with overhead or underground networks. The principal advantages claimed for the system are: bonding and earthing connections unnecessary; services can be connected at any time without cutting the distributor; hot compound not required; low costs.

The three essential components of the system are "Wethertex" cables, insulated with the makers' special compound rubber dielectric, "Tropalite," strongly braided and impregnated and finished with special weather-resisting paint; "C.B. Ferry" metal fixing clips made of a stable alloy unaffected by atmospheric conditions; and "C.B.B." service boxes, affording neat and effective watertight connections.



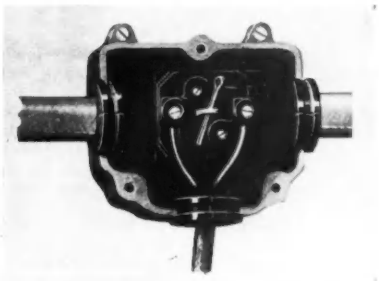
"Wethertex" Cable

The flat twin cable is supplied in stone or chocolate colour, and is standardised in six sizes—0.0225, 0.04, and 0.06 sq. in. for distributors, and 0.003, 0.0045, and 0.01 sq. in. for services.

The clips are wrapped round the cable without drawing the ends through buckles or slotted heads, and the locking is generally on the centre of the cable, with three thicknesses of metal on the face. They are sufficiently flexible to be manipulated by hand and are supplied in six sizes.

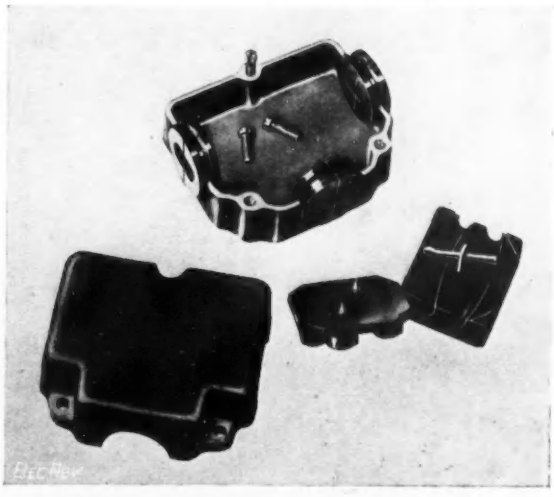
The service box consists of a cast-iron container in two parts, one half being readily fixed to the wall by nails or screws. In making a connection, the outer braiding of cable is removed for a distance of 3½ inches, and the cores are separated ¾ inch and the tapes removed for about 3 inches. The separated cores are then placed in the lower half of the connector block and pressed into the grooves, the connector block cover plate being placed in position and secured by a cotter pin. The service cable is then fixed and connected at the house service cut-outs, after which the ends are trimmed and secured in the terminals of the connector block.

The main insulating bushes and the service cable insulating bush are next placed in position in the lower part of the box, which is then filled with "Kalanoid" compound. The connection to the main is made by simply screwing down the two pointed screws which penetrate the rubber dielectric of the main cable and force their way between the strands of the conductor, making a sound connection which only has to carry the current taken by the service cable and does not affect the continuity of the main cable. The rest of the "Kalanoid" supplied with the box is placed in the lid, so that when the lid is placed in position and secured by the three cheesehead screws it will be squeezed round the insulating bushes and the box joint, becoming entirely weatherproof.



Completed Joint, except for the Cover

Assuming that a modern housing scheme is to be given a supply of electricity, a properly balanced l.p. underground or overhead distribution network is arranged with main services to suitable distributing points on selected buildings. From the fuse boxes twin "Wethertex" distribution cables will be run, fixed to the walls—as high as possible—by means of "C.B. Ferry" clips, the number of houses allocated to each distribution cable depending on the load and the sectional area of the conductor. Where the cable spans a gap between blocks of houses, it is suspended from, or attached to, a catenary. During the erection of a length of distributor it is unnecessary to consider whether all or only part of the houses are to be given a supply, as in making individual service connections the distributor is not cut, and neither bends nor bights are required.



Components of Cable Box; Split Box, Bushes and Connection Block

Electricity at the South Wales Ports. By B. C. Williams

The Great Western Railway utilises modern electrical equipment to carry out a progressive policy at its chain of docks

Three-ton Electric Luffing Jib Cranes at Kings Dock, Swansea

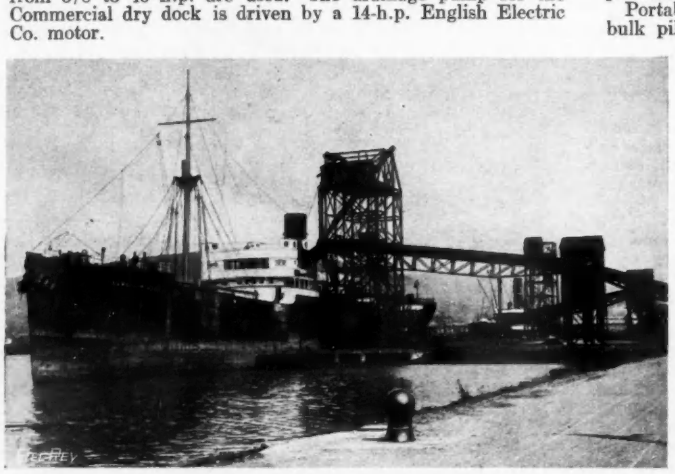
ALTHOUGH the staple industries of South Wales have been hard hit by depression during the past few years, the Great Western Railway has, with commendable foresight, applied itself to the reorganisation and speeding up of the facilities at the chain of docks, including Cardiff, Newport, Barry, Port Talbot, and Swansea docks, which passed into the company's possession in 1921. In the development of this scheme electricity has been an important factor, with the result that the South Wales ports can now justly claim possession of the most modern docking system in the world.

Power Supply at Newport

The company formerly generated its own power, for use at the Alexandra Dock, at a power station situated at the main lock entrance of the dock. Electricity was distributed at 3,660 V, 3-phase, 50 cycles, from this station to suitable centres to be transformed to 440 V, 3-phase, for power, and 110 V, single-phase, for lighting and heating. The town dock was supplied from the Newport Corporation mains at 460 V d.c. for power, and 230 d.c. for lighting and heating.

Following the closing of the Town Dock all the power appliances at that dock were put out of use, though a certain amount of electric lighting was retained. In the following year the company's power station at Alexandra Dock was closed down and the entire supply of electricity is now taken from the Newport Corporation at 6,000 volts, three-phase, 50 cycles. This is transformed at the central sub-station to 3,660 volts for h.v. distribution, to 440 V, 3-phase, for power, and to 110 V, single-phase, for lighting and heating. The demands arising from the installation of additional power equipment in the neighbourhood of the South Quay have necessitated the provision of a new sub-station at that point.

Electrically operated quay-side cranes are used for dealing expeditiously with cargoes, including four 6-ton Stothert and Pitt level luffing jib cranes, one 6-ton crane by the Clyde Crane and Engineering Co., and six three-ton Stothert and Pitt cranes. Fourteen cranes of similar types have lately been added to the quay-side equipment. Electric capstans, operated by 15-h.p. Crompton Parkinson motors, are used to facilitate the berthing of vessels. The warehouses and transit sheds are provided with 1-ton portable cranes, with 5-h.p. B.T.-H. motors, also supplied by Stothert and Pitt. In the civil and mechanical engineers' workshops a variety of motors varying from 5/8 to 46 h.p. are used. The drainage pump for the Commercial dry dock is driven by a 14-h.p. English Electric Co. motor.



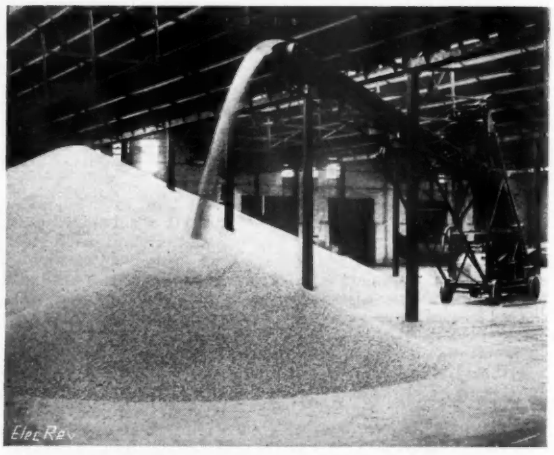
Grain Conveyor in Operation at Cardiff

A special feature of the quayside cranes is the special lighting equipment with which they are fitted, providing ample light, not only on the decks, but also in the holds, of vessels being served by the cranes. This equipment ensures sufficient illumination for all requirements, and with its aid vessels can be dealt with as speedily during the night as by daylight.

The Cardiff Docks

The electrical supply for the whole of the docks system at Cardiff is taken direct from the Corporation. All of the hydraulic power houses at the docks are electrically equipped. The No. 1 power house has two 59-b.h.p. Crompton Parkinson motors driving centrifugal pumps, and the Roath power station is fitted with 375-b.h.p. motors of the same make, driving pumps feeding the suction tanks. The No. 3 power house is the largest of the three, its equipment comprising four 650 b.h.p. Metropolitan-Vickers motors directly coupled to centrifugal pumps for the supply of high-pressure water, and two 105-h.p. M.V. motors coupled direct to low-pressure pumps for supplying the suction tanks.

As Cardiff handles as much as 25,000,000 tons of coal per year, even during the present depression, much of the machinery is specially designed to load and bunker vessels with the utmost speed. Coal tips are being reconstructed to deal with twenty-ton wagons in place of the more usual ten-ton vehicles, and concerns in the coal trade are being encouraged to use the new type of wagon. Although the actual tipping of the wagons is done by hydraulic power, six tips at the Queen Alexandra Dock are travelled and traversed electrically. Three similar appliances are to be provided at this dock, which will complete the conversion of the south side of the dock. Speeding up at the Roath dock is to be aided by the provision of an electrically-operated belt conveyor for coal. The greater part of the docks is electrically lighted, and the few remaining portions which are gas lit are being converted. The East Dock engine shed and shunting yard are the latest parts of the system to be electrically lighted, and electric power has been provided in the engine fitting shops.



Belt Coal Conveyor at Port Talbot Docks

Portable conveyors for grain are used at the quayside, and bulk pilers, operated by 14-5-h.p. G.E.C. motors, and grain conveyors driven by 48-h.p. motors by the same makers, are features of the transit sheds. For dealing with general cargoes level luffing jib cranes similar to those in use at Newport Docks are installed and are driven by motors varying from 6 to 32 h.p.

The South Wales Power Distribution Company supplies electricity to the Barry Docks at 11,000 volts, three-phase, 50 cycles, which is transformed down to 3,300 volts and distributed to nine sub-stations and three switch centres. It is redistributed at 440 volts 3-phase and 250 volts single-phase.

As at the other Great Western ports the coal roads, coal hoists, workshops, and docking signals are electrically lighted. The caisson of the commercial dry dock here is operated by a 15-h.p. C.P. motor. Corn crushers, bag pilers, conveyor belts, &c., in the transit sheds are electrically driven also.

The ten years during which the docks have been in the hands of the G.W.R. have been bad years for the shipping and heavy trades, and no reasonable comparison of operating and maintenance costs can be obtained. Preference is being given to electrical power for all purposes, and the steam-driven pumps at the hydraulic power house at the Barry Docks are being superseded by electrically-driven pumps.

Fire-fighting Plant. By H. E. Hutter, A.Am.I.E.E.

Its application to switchgear, machines, and transformers

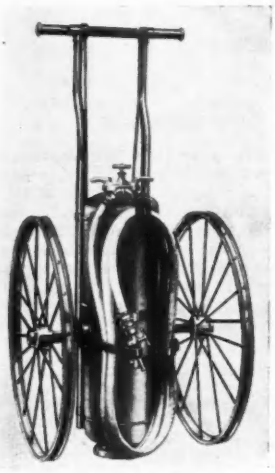
THE risk of fire is always present where oil is used in large quantities, as in the case of switchgear and transformers. Enclosed rotating machinery is also, by reason of the ventilation system, liable to heavy damage by a small outbreak of fire.

These risks can be completely covered by the use of a CO_2 gas, or a "foam" system, each in its own sphere of action.

The Foam System

The principle of action of the foam system is that by the addition of water to a special powder, CO_2 is given off; an acid and an alkali are used and the gas given off in conjunction with the stabiliser is captured and expanded to form tough skinned bubbles which form the foam, the volume of which is approximately ten times the quantity of water used. The foam is projected from the apparatus by the pressure of the chemical reaction set up, and is propelled through rubber-lined hose or fixed pipes and distributed to the fire by special pipes. The capacity of the foam-generator is usually determined on the basis of a minimum of 6 in. of foam over the area to be protected. In cases where a number of individual areas are to be protected from one generator, the capacity is based on the largest single area.

Where transformers are situated in bays which are partly open or exposed to draughts, foam is practically the only medium which can be used and which will not be affected by draughts. The arrangement of the distribution system is such that a liberal discharge can be given over the top of the switch or transformer, so that the foam will quickly flow down and spread over the floor. If the floor area is comparatively large, separate foam discharge points are arranged at ground level. In situations where there is risk of short-circuiting high-voltage lines by the application of the foam, the main discharge is limited to the ground area.



Extinguisher for Outdoor Use

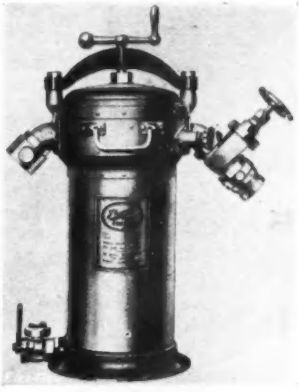
Burning Oil

In the majority of fires involving electrical equipment containing oil, the oil container discharges the oil on to the ground either by fracture or overflowing, and this burning oil not only flows over a considerable area, but also has the effect of maintaining the heat application to the oil container. Under these conditions the foam will extinguish the oil on the ground, and the flames at the higher levels may be dealt with by portable machines. The burning oil that has been covered with foam is immediately extinguished, and presents no danger of re-ignition for a number of hours, as the foam maintains an effective blanket over the oil. A fixed installation may be backed up by the provision of a foam hydrant. Foam is a conductor of electricity, so that the greatest care must be exercised when playing near high voltage connections.

The foam generator illustrated herewith uses the powder prepared in the form of a cartridge, which makes for speed of operation; the cartridge is inserted in the top and the valve controls the water supply, the foam connection being attached to the other coupling. In the case of isolated switch units or transformers where it is impracticable to protect them in conjunction with the main plant, the use of a portable plant will provide all the necessary protection. The portable plants are made in all sizes from the two-gallon hand unit to the 34-gallon machine; the larger types are mounted on wheels and are entirely self-contained, no separate water supply being required. The indoor machines have the wheels fitted as close to the body as possible to permit the passing of the machine through doorways; for outdoor use the wheels are widely spaced as shown above, which illustrates a 34-gallon machine, thus allowing easy passage over rough ground. The range of the jet in the larger machines is of the order of 50 ft., this range remaining steady during operation. The machine illustrated on p. 396 is typical of those being supplied to the Central Electricity Board for the protection of outdoor transforming stations, the capacity being 10 gal.

The CO_2 Protection System

The protection of switchgear and transformers installed in rooms that are of reasonable size or capable of sub-division can be carried out to a very high degree of efficiency by means of the use of CO_2 gas. This gas is a most effective fire extinguisher, among its many advantages being that combustion cannot take place if the area concerned is saturated with approximately 15 per cent. of the gas. It is extremely quick in its action (a matter of seconds only), it is non-poisonous and non-corrosive, and its dielectric strength is higher than that of air. The gas being heavier than air will remain over the site of action without dispersing.



Foam Generator

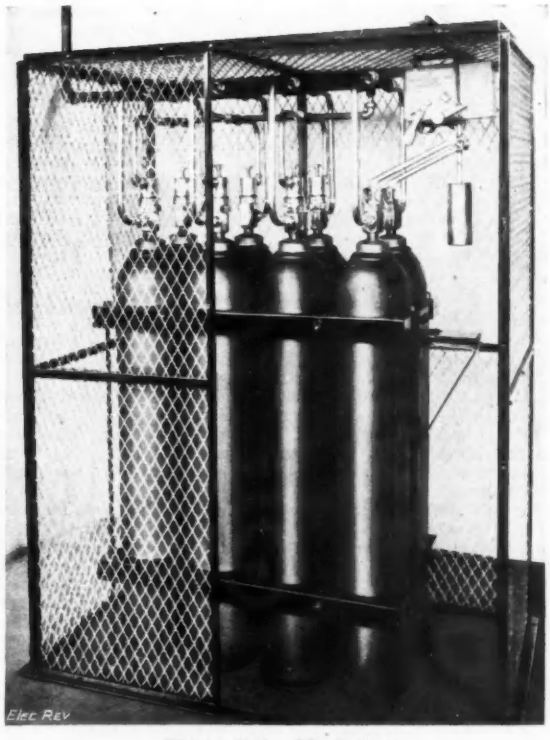
The installation consists of one or more cylinders containing 50 lb. of the gas in the liquid form, the volume of gas being 450 to 500 times that of the liquid form. The cylinders are fitted with a special valve which may be operated by hand or automatically on the occurrence of fire. When a number of cylinders are used they are connected to a common manifold, the gas being in liquid form until it is actually dispersed from the nozzles. The quantity of gas allowed is sufficient to permit a saturation of from 33 to 50 per cent., which allows a margin of safety, as a flame will not exist in an atmosphere containing 15 per cent. of the gas. Complete protection is afforded by this method to switch rooms and transformers, except in the special cases considered under the foam system, where the rooms are either big and unprovided with subdivisions, or else exposed to the open air. The automatic opening of the cylinder valves can be arranged to lower asbestos shutters over all windows and openings, thus preventing the admission of air.

By virtue of the gas having a dielectric strength higher than that of air it can be used while the apparatus is still alive. The valves in the automatic installations are controlled by various types of detectors located at the points protected.

Application to Rotating Machinery

The protection of rotating machinery having a closed ventilating system can be accomplished by the CO_2 system without any alterations, the nozzles being arranged in the ventilating ducts. If the system should not be of the closed circulating type, automatically closing dampers are required and also a by-pass duct to prevent excessive static pressure when the gas is discharged.

As all closed circuit ventilating systems permit small quantities of gas to leak away, to prevent the concentration of the CO_2 falling below the safe figure, arrangements are made for



Eight-cylinder CO_2 Battery

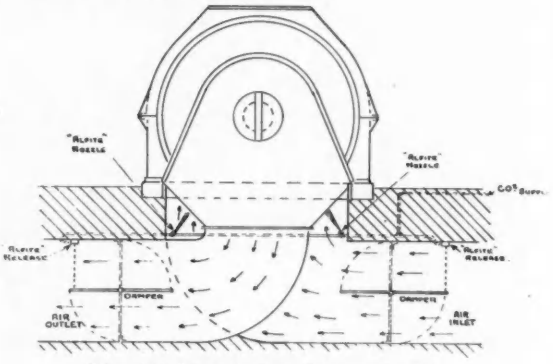
Portable "Foam" Extinguisher

the delayed operation of other cylinders during the period of deceleration of the machine. For example, on the outbreak of fire the first discharge may be from four 50-lb. cylinders, followed by other single cylinders at gradually increasing time intervals until the machine has come to rest, this delayed operation being automatically arranged. It will be appreciated that after an application of this gas to the machine there will be no cleaning out or drying required, as would have been necessary if water had been used. The application of this system to an alternator is illustrated.

A number of portable extinguishers are in use, such as the Foamite illustrated, which is a small cylinder of CO_2 gas, soda-acid, and tetrachloride. The soda acid cannot be used on electrical apparatus that is alive or on oil fires; the tetrachloride type is, however, the best for both oil and live electrical apparatus. When the liquid falls on the flames it is vaporised and the gas which is then given off acts as a blanket excluding the free access of air which is, of course, essential to the supporting of combustion.

The CO_2 system can be designed to operate either automatically or manually on the first outbreak of fire. The gas is discharged into the ventilating system, the first discharge being sufficient to extinguish the fire; all dampers opening to the atmosphere must be closed.

Thanks are due to the Pyrene Co. and Messrs. Foamite Firefoam, Ltd., for permission to reproduce the illustrations of the foam generator and the outdoor extinguisher, and of Foamite and Alfite CO_2 apparatus, respectively.

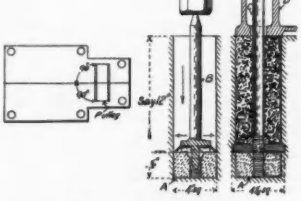


Alternator Protected by Carbon Dioxide

Bolting Down Bed-plates

The use of a multiple washer provides a solid head for foundation bolts

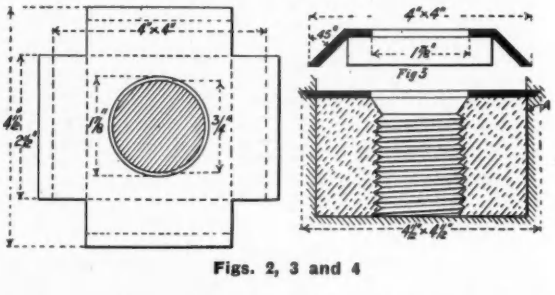
THERE are various well-known and approved ways of fixing the bolts for holding down the bed-plates of generators, electric motors, &c. To build in the bolts and plates while the concrete is being filled in for forming the foundations is a sound method, but there are circumstances under which it cannot be adopted, *e.g.*, when quarried stone is used for the foundation, and (assuming the foundation to be of concrete) when machines are to be installed or reinstalled.



Figs. 1, 1A and 1B

In such cases the means here described is advocated. On completion of the stone or concrete foundations, the procedure is as follows:—The usual template being provided (fig. 1) with a centre line, either the pulley shown or a 90-deg. line is added for precision in marking off the six bolt holes. Into each of these holes drop the cast-iron nut A, fig. 4, tapped 1¾ in. (Whitworth) and well bell-mouthed. A series of steel washers, ¼ in. thick, roughly chopped out of steel plate, are drilled (or punched) to 1⅞ in. diameter (see fig. 2). These are then bent to the form shown in fig. 3, but with an easier bend. The cast-iron nut A is shown in fig. 4. Fig 1A shows the nut at the bottom of the hole in the stone, or concrete, with one washer (fig. 3) lying with its concave side on the nut A. In fig. 1B is shown a drift, and with this and a sledge-hammer the washer is flattened out, forcing itself into the stone, or the concrete, of which the foundation consists. One washer is quite easily flattened and at the same time expanded in four directions; other washers follow to the desired number (fig. 1B).

The washers being satisfactorily flattened, and kept central with the nut A by means of the pilot end of the drift B, the stud bolt C is screwed into the nut A, as shown in fig. 1B, the nut on the stud bolt acting as a *fixed* collar on the bolt. It functions by gripping the multiple washers solidly, with the



Figs. 2, 3 and 4

nut A converting the bolt, the washers, and the nut A into one absolutely rigid and unyielding bolt head. D shows just *one* corner of the bed-plate of the motor, or the generator, which has to be fixed; when they have been fixed and lined up, the 4-in. square holes are filled with cement grout.

It will be seen that the nut A, besides functioning as a nut, forms a solid anvil on which to expand the washers; it is made square in form to prevent its being turned while the stud bolt is being screwed in with pipe grips.—ERECTOR.

Electrification in Indo-China

CONSTRUCTIONAL work on one of the most important power systems in the Far East will soon be started as the result of a recent contract entered into between the Indo-China Government and the Société Indo-Chinoise d'Electricité for the electrification of the principal cities and towns in the Tonking Delta. The contract has been submitted to the Minister of the Colonies for approval, and L'Eveil Economique gives the following outlines of its main provisions:—

1. Construction of a main power distribution system supplied from the central stations at Hanoi and Haiphong and interconnecting lines between Hanoi, Haiphong, and Namdinh.

2. Construction of a main transmission network to supply centres not yet electrified and to connect up with the main network the centres already supplied from small local plants.

3. The above networks will be supplied by power from, (1) the central power station at Haiphong, and (2) from a new 40,000-kW power station now being erected at Hanoi, which is sufficient to supply all the power requirements of the Delta.

The contact calls for the completion of the programme within five years, according to the following schedule:—

1st Period.—Transformation of the Hadong transmission system; electrification of the towns of Phu-Ly, Ninh-Binh, Thai-Binh, and Hung Yen; connecting up the Hanoi and Namdinh power stations.

2nd Period—Connect Bac-Ninh, Dap Cau and Phu-Lang-Thoung with the central power station at Hanoi and link up Hanoi with Haiphong, bringing Haiduong into the main network.

3rd Period.—Extension of network to supply the towns of Phue-Yen, Vinh-Yen, Tam Dao, Thai-Nguyen, Sontay, and adjacent districts.

4th Period.—Extension of network to supply Vietri and Pho-Tho.

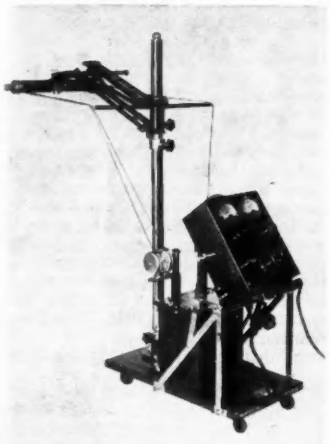
The above is merely the outlines of the essential features of the main scheme which will ultimately be expanded to embrace all the other centres on the Tonking Delta. The main system represents a length of over 375 miles of high-tension transmission lines covering the Delta with a network from which the secondary lines will supply electricity for operating smaller stations, mining concessions, pumping, and other industrial plants. Three-phase a.c. at 30,000 V will be fed into the main network from the central power stations, and stepped down to 208 V for operating motors and 120 V for lighting.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Portable X-Ray Unit

The "Watson-Sankey" portable X-ray unit marketed by WATSON & SONS (ELECTRO-MEDICAL), LTD., Sunic House, 43-47, Parker Street, Kingsway, W.C.2, which has been designed in collaboration with Dr. R. H. Sankey, is a series of component parts which can be quickly assembled to form a complete unit to yield an output considerably larger than the majority of portable equipments and sufficient for all normal radiographic work. Each component is sufficiently small and light for easy transport, and fits comfortably into a dust-proof canvas case fitted with carrying handles. The component parts are a trolley base, on which the rest of the apparatus is mounted; box-type switchboard; h.p. transformer, and tube stand. A radiograph can be taken a few minutes after the arrival of the components in the ward, &c. The transformer is of the makers' standard oil-immersed type, with special removable h.p. terminals for easy transport. The output, 90 kV peak at 10 mA, is normally fixed, but by means of a special auto-transformer it is possible to obtain a range of from 50 to 90 kV.



"Watson-Sankey" Portable X-Ray Unit

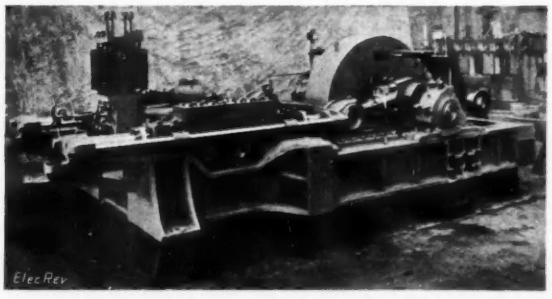
The switchboard carries a milliammeter in circuit at the neutral point of the transformer, a voltmeter suitably marked to ensure the supply of the correct voltage to the tube, two safety fuses, adjustable control for selecting correct reading of voltmeter and a main switch.

An automatic exposure switch is connected to the switchboard by a length of flexible cable, so that the operator is allowed reasonable freedom of movement. The tube stand is specially designed and is arranged for use with a "Metalix" tube. It allows of movement of the tube to any position for radiography, and has sufficient extension for work over either side of a normal bed. All the movements can be locked, and h.p. connections are made from the tube to the transformer by spring rheophores through insulators to the tube. Dust-proof canvas carrying cases for all components can be supplied.

Oil-line and Pressure Power Pumps

WORTHINGTON-SIMPSON, LTD., Newark-on-Trent, Notts, have produced a large number of oil-line and pressure pumps for various duties in all parts of the world.

There is a range of fourteen 3⅝ in. × 18 in. horizontal duplex double-acting oil-line pumps, each having a capacity of 3,750 barrels of oil per 24 hours against a normal working oil pressure of 600 lb. per sq. in., with a maximum working pressure of 660 lb. per sq. in. The pumps are fitted with special stuffing boxes to enable them to be converted from 3⅝ in. to 5 in. diameter plungers. With the 5 in. plungers fitted, the capacity is 7,500 barrels of oil per 24 hours at a speed of 37 r.p.m. The pumps are fitted with double reduction double helical gearing, flexible coupling, motor baseplate and continuous oiling gear. The plungers are of chilled cast-iron, and the valve service consists of stainless-steel ball valves working on renewable seats. Each pump is fitted with a relief valve, by-pass valve, alleviator, and 8 in. suction and 6 in. discharge openings, and is driven by a 100-b.h.p., 3,000-V, 3-phase, 50-cycle motor running at 730 r.p.m. The illustration shows a 4 in. × 18 in. horizontal duplex double-acting hydraulic power pump having a capacity of 220 gal. per min. against a working pressure of 2,900 lb. per sq. in. The pump runs at 70 r.p.m. and is driven by a 520-b.h.p. motor running at 491 r.p.m. The pump is provided with a forged-steel pump end fitted with high-tensile steel plungers and a stainless-steel valve service. The cross-heads are of cast-steel, and an extended cast-iron baseplate is provided for carrying the pump and motor. The motor is connected to the pump by a flexible coupling and drives through a single reduction of double helical gearing. A forged-steel alleviator is provided with the pump together with a suitable relief valve and by-pass arrangement.



Worthington-Simpson Hydraulic Power Pump

A Pneumatic Massage Pulsator

EDISON SWAN ELECTRIC CO., LTD., 123-5, Queen Victoria Street, E.C.4, is now offering the new "Uvral" pneumatic massage pulsator, the outstanding features of which are that it has no motor to go wrong, or movable parts to wear and get out of order, and it requires neither oiling nor attention.

Another feature of the "Uvral" is its light operation weight; the applicator and handle together weigh less than two ounces. The current consumption of the set is only 50 watts, and it is suitable for all voltages from 200-250 a.c. or d.c.

The principle is that of a magnetically operated diaphragm pump and valves, the air being carried through a rubber tube to the applicator. The apparatus is entirely British made and is supplied in an imitation lizard-skin rexine case, with six applicators and a moulded adaptor and applicator handle, with full instructions for use.

"Uvral" Pneumatic Massage Pulsator

Small Battery Chargers

WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD., 82, York Road, London, N.1, is now supplying, in addition to the larger sizes of battery chargers, two small sets specially designed to meet cases where only a small number of batteries is required to be charged at the same time, particularly for operating switchgear, telephone equipment, &c. In both these chargers, known as the R.P.$_5$ and R.P.$_{10}$ models, the Westinghouse metal rectifier is used for converting a.c. supply to d.c. Each charger contains the following additional components: a transformer, wound to suit the purchaser's supply voltage and frequency; a tapping switch; a means of fine control; a moving-coil ammeter; a.c. and d.c. fuses, to protect the charger and batteries from damage; triple-pole main switch; "Bakelite" shrouded terminals for the d.c. output; and a 12 ft. length of 70/36 flex for the a.c. input. The R.P.$_5$ set is supplied in five different sizes, having outputs ranging from 5 A for three cells to 0.25 A for 60 cells. The R.P.$_{10}$ set is made in twelve sizes with outputs varying from 3 A (10 cells) to 0.25 A (120 cells). A feature of these sets is that the charging rate is continuously variable down to zero on a battery of a fixed number of cells, thus adjustment of trickle-charge can be made within fine limits. Another use of these types of charger is where a varying number of cells is to be charged, the range of regulation being sufficient to charge from one to the maximum number of cells at the full charging rate, which can be reduced to about half the full value when charging from a quarter of the maximum number of cells upwards.

Westinghouse R.P.$_{10}$ Rectifier Set

Book Reviews

Sags and Tensions in Overhead Lines. By C. G. WATSON. Pp. xii+192; figs. 81. London: Sir Isaac Pitman and Sons, Ltd. Price 12s. 6d. net.

This volume, intended for the use of engineers, designers, and consultants engaged on electrical power distribution, emphasises the degree to which the different branches of electrical engineering have become specialised. Here we find that from the various phases of overhead-line engineering, two can be selected to fill nearly 200 pages of ordinary text-book size with data and examples capable of direct and easy application to current everyday problems which arise in planning the transmission and distribution of electricity.

In nine chapters the author deals with the properties of the catenary, the Thomas chart for determining sags and tensions, the sags and tensions when the supports are at different levels, the results accruing from using a conductor not previously stretched, stringing charts, the behaviour of lines after erection, the sags and tensions in the special case of a river crossing using alternative forms of insulator supports, sundry information relating to sags, loadings, and conductor constants, and finally a study of the sags and tensions calculated by means of the theory of the parabola. The book is completed by four appendices on hyperbolic functions, catenarian functions, tables, and constants used in determining the line characteristics when the supports are at different levels, table of tangents, and the usual index.

In the general study the author takes due account of all the factors influencing the behaviour of the lines, namely, temperature, conductor weight, wind pressure, ice and bird loadings, and stringing tension, and the effects of these, singly or in combination as the circumstances demand, in calculating the sags and tensions, are shown in exact detail. The treatment of the subject embodies a happy combination of mathematical and graphical presentation and worked examples which, we think, could hardly be improved upon. The sequence of chapters is entirely logical, and together they form a well-balanced study of the subject. The book is essentially of a practical nature and well adapted to meet the requirements of those to whom it is addressed. The format is in the publisher's well-known style, and we can recommend the volume cordially to all those interested in the subject.

The Romance of Electricity. By WILFRID L. RANDELL. Pp. xviii+238; 72 illustrations. London: Sampson Low, Marston & Co., Ltd. Price 10s. 6d. net.

Some years ago Mr. Randell wrote a life of Michael Faraday, and now—in the year of the commemoration of Faraday's chief discoveries—he has opportunely produced a book dealing with the consequences of those discoveries.

The present book is primarily intended for the use of the non-technical man who wishes to have an intelligent grasp of electricity and its development. The term "romance" in the title should not be taken as implying a fanciful treatment of the subject, which is dealt with as accurately as it is readably.

The opening chapters contain easy definitions of the most popularly used electrical terms and an explanation of the difficulties involved in framing uncomplicated tariffs, and brief biographies of the pioneers of electrical science and industry (50 pages), setting out exactly what were their principal contributions. The account of how electricity is generated gives just the kind of information a layman—an intelligent layman—would require, but the succeeding chapter on Busy Hours in Power Stations will appeal to many ex-shift engineers also. The latter are accustomed to regard their era as one of hardship and excitement compared with present day conditions, though the accounts here given of happenings during the floods in January, 1928, rival in dramatic quality most old-time experiences.

The history and organisation of the supply section of our industry is clearly described and includes typical organisations of large undertakings. Telegraphy and telephony, wireless and broadcasting receive brief but, for the present purpose, adequate treatment and the emphasis laid on the importance of Fleming's valve indicates the sound sense of proportion of the author. The chapter on Lamps and Lighting (including notes on the operation of the luminous-discharge lamp, photo-electric cell, and traffic signals) omits one item that would have interested many readers, *viz.*, the striking improvements in efficiency by virtue of which the consumer now obtains so very much more light than he could in bygone days for the same money.

Railway electrification is brought up to date by a short reference to the Weir Report. The range of subjects treated also includes such typical items as electricity in the countryside, in the home, in industry, and at sea. In the chapter on Electricity and the Doctor, actinotherapy is referred to as "violet-ray" instead of "ultra-violet ray" treatment. As confusion already exists in the public mind on this subject, the mis-print is unfortunate.

The work is right up to date and the illustrations are such as to appeal to the many readers whom this book will interest.

Electrical Engineering. By C. V. CHRISTIE. Pp. xxi+662; figs. 562. London: McGraw Hill Publishing Co., Ltd. Price 25s. net.

The fact that a fourth edition of this work has been called for seems to indicate that it has found a wide field of acceptance in America, its country of origin. As a comprehensive text book for the student of electrical technology, it has several desirable features. The subject is developed logically, commencing with the study of electrostatics, and includes the arithmetic of the direct current and the alternating current circuit, electrical machinery, and long transmission lines. The subject is admirably illustrated by a large number of numerical examples, fully worked out, and there is a somewhat limited selection of problems for solution at the end of the book. The answers to these problems are not given, as they undoubtedly should be. With one exception, all the matter included in previous editions has been retained, while in addition to the usual revision work incident to the preparation of a new edition, sections have been added covering the design of direct-current generators, and the problem of system stability.

There are one or two sections of the book which call for some criticism. The chapter on what the author calls complex alternating-current waves is unsatisfactory for a work of the standard aimed at, and the treatment of wave analysis is somewhat meagre. The author might have followed the lead of other American writers in giving fuller treatment to the theory of three-phase circuits. The short chapter in the book dealing with this subject is limited to a conventional treatment of balanced circuits, with the threadbare discussions of balanced load power factor determination, and so forth. None but a very rudimentary book on electrical technology should omit a discussion of unbalanced circuits, and no discussion of these circuits can well ignore Fortescue's theory of symmetrical components.

A further point calling for comment concerns the matter omitted from the previous edition, to which reference has already been made. This omitted matter was a short chapter on electrical instruments. As the book now stands, therefore, instruments and measurements are not dealt with at all. While one may well agree that it is better to ignore this subject entirely, rather than treat it in a scanty and superficial manner, there can be no doubt that a work in which electrical measurements are not treated cannot be considered complete. Although it is no part of a reviewer's business to criticise an author's scheme in regard to the field which he intends to cover, we cannot but feel, of the book before us, that a discussion of electrical instruments and measurements, in keeping with the general standard aimed at, might have rendered the book of greater service to the average student even had it been necessary to curtail the sections dealing with the design of electrical machinery.

Switchgear Practice. By H. E. POOLE, B.Sc.(Lond.), A.M.I.E.E., A.C.G.I. Pp. xi+227; 100 figs. London: Chapman & Hall, Ltd. Price 15s.

This book, which deals more particularly with gear suitable for voltages and breaking capacities in most common use, should be regarded as a review of present-day practice in switchgear rather than as a text book entering deeply into theoretical principles. Further, in general, greater attention is paid to the mechanical aspect than to the electrical aspect of the subject. A very concise style is adopted in the book, thus enabling many examples of appliances to be described, but, in some cases, this tendency appears to be carried rather too far and descriptions which are quite intelligible to those having a general knowledge of the appliance under notice may not be so readily followed by those having less familiarity with the subject.

The materials used in the construction of switchgear, the spacings necessary to secure safety, and the mechanical arrangements and devices adopted in construction, are dealt with at length, the latter points being illustrated by many specially drawn line diagrams and this aspect of the book can be heartily commended.

It would seem, however, that more attention might have been paid with advantage to the electrical problems associated with switchgear. Thus, the section devoted to protective relays is short and, for example, there is but little mention of the "impedance" type of relay, the possibilities of which are attracting considerable attention at the present time and about which there is not a great deal of published information. Descriptions of certain other types of protection are also omitted. The uses of reactors are but lightly touched on and no information is given concerning the modes of construction of these devices. There is an undesirable looseness in the use of certain electrical terms on p. 89, where, in a paragraph headed "Watt Meters," the first sentence reads "Watt-hour meters are in wide use for the measurement of power." It is noticeable also that in a number of cases the modes of spelling and the forms of abbreviation recommended in the British Standard Glossary of Electrical Terms are not adopted. An important and particularly useful feature of the book is that many Continental designs are described and compared with designs of similar appliances of British origin.

The book, which throughout gives evidence of having been written by one having considerable practical experience in the subject, contains a very considerable amount of information of a practical character, and will be of great service to those engaged in the manufacture of switchgear and also to those concerned with the purchase or installation of such gear and who desire information in regard to current practice and possibilities.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

A Uruguayan Hydro-Electric Investigation

A tour of Europe is being made by Mr. Bernardo Kayel, of Montevideo, for the purpose of investigating the situation of the utilisation of water power in different countries and the position of the electrical manufacturing industries which have been associated with the execution of such hydro-electric works. The visit is in connection with a scheme brought forward in Uruguay for the construction of a dam across the River Rio Negro, and the installation of hydro-electric plant for the extension of the supply of electricity throughout that country. At present the question is before the Chamber of Deputies in Montevideo in the form of a Bill to authorise an expenditure of $30,000,000 for the carrying out of the work for State account. If no unforeseen circumstances arise the matter in six months' time will have proceeded so far that a number of the leading world firms will be invited to submit offers for the execution of the scheme, which aims at the creation of an artificial fall of 30 metres at a distance of about 310 miles from the mouth of the Rio Negro, which will yield all the energy required for the electrification of Uruguay. Mr. Kayel has already been to France, Czecho-Slovakia, Germany, Hungary, Austria and Sweden for the purpose of inspection and is said to be also visiting Belgium, England, Italy and Spain.

The European Aluminium Syndicate

It is reported from Paris that in all probability the European Aluminium Syndicate will be prolonged at the end of this year, as was the case two years ago. The syndicate comprises about 50 per cent. of the world production, the other half being produced by the American and Canadian works.

Australian Duty on Radio Valves Postponed

The date of the coming into operation of the increase in duty imposed on radio valves imported into Australia from 2s. each, or 25 per cent., whichever is the higher, to 40 per cent. has again been postponed.

Birmingham's New All-electric House

The new all-electric house, which has been equipped under the auspices of the Local Circle of the British Electrical Development Association, will remain open for inspection at 1,532, Stratford Road, Hall Green, Birmingham, until to-morrow. Typical examples are to be found there of all the latest electrical devices for utility and comfort, and special cookery demonstrations are being given every afternoon. Pendant lighting fittings, wall-bracket displays, and standard reading lamps for local lighting are to be found in all principal rooms, the installation in the dining-room (shown below) being particularly neat and effective. Tubular heaters and ingeniously arranged fires demonstrate the artistry and economy with which a comfortable temperature can be maintained throughout the house on the coldest days. The kitchen-scullery, a corner of which is reproduced below, perhaps supplies the *pièce de résistance* with cooker, washer, multi-boiler, irons, kettles, sewing machine, clock, fan, a portable light and heater for the garage, and numerous other devices. From the kitchen, too, is governed the bathroom immersion heater by means of a dual control. The rooms upstairs are also provided with up-to-date electrical appliances, and well-chosen lighting points and plug positions for fires give both comfort and usefulness. A "Homesun" lamp in one of the bedrooms does its share to make good the deficiencies of a poor summer. Similarly noteworthy is the apparatus in the bathroom, where are to be found a lighted shaving mirror, a "Lecco" stimulator, a heated towel-rail, storage water-heater, immersion heater, hair dryer, and bowl fires.

Non-ferrous Metal Manufacture in Canada

The Dominion of Statistics at Ottawa has published a preliminary summary report on the manufacture of non-ferrous metals in Canada in 1930. The total value of production was $259,899,972, a decrease of $23,600,000 as compared with the preceding year. The output from the electrical industry, which is the most important of the non-ferrous group, amounted to $113,192,451, as compared with $113,796,002 in 1929. The industry is situated mainly in Ontario and Quebec, the former province possessing 67 per cent. of the factories, which produced 64 per cent. of the output, the latter having seventy-five establishments and an output valued at $62,717,316. British Columbia was third with a production valued at $27,321,727 and with twenty-five plants. The value of imports into Canada of non-ferrous metals and their products during 1930 was $66,926,975, as compared with $90,686,274 in 1929, of which 82 per cent. came from the United States, and 10 per cent. from the United Kingdom. Exports totalled $115,766,626 (against $148,164,138), the United States receiving $73,377,241, and the United Kingdom $18,417,009.

Forthcoming Exhibition

A Modern Homes and Health Exhibition is to be held in the Millbay Drill Hall, Plymouth, during the ten days commencing Wednesday, October 14th.

American Overseas Trade in Domestic Electrical Appliances

That the current industrial depression has not been without its effect on the overseas demand for American domestic electrical appliances is indicated by the following table giving the exports from the United States during the first six months of 1930 and 1931, the total of £1,335,489 showing a decrease of £424,908, or nearly 25 per cent.

	January—June. 1931.	1930.
Household refrigerators	910,166	1,131,875
Electric washing machines	102,323	214,460
,, vacuum cleaners	124,022	170,967
,, irons	22,443	32,003
,, cooking ranges	51,765	24,597
Other domestic motor-driven appliances	48,947	92,817
Other domestic heating and cooking devices	74,923	93,678
Total	£1,335,489	£1,760,397

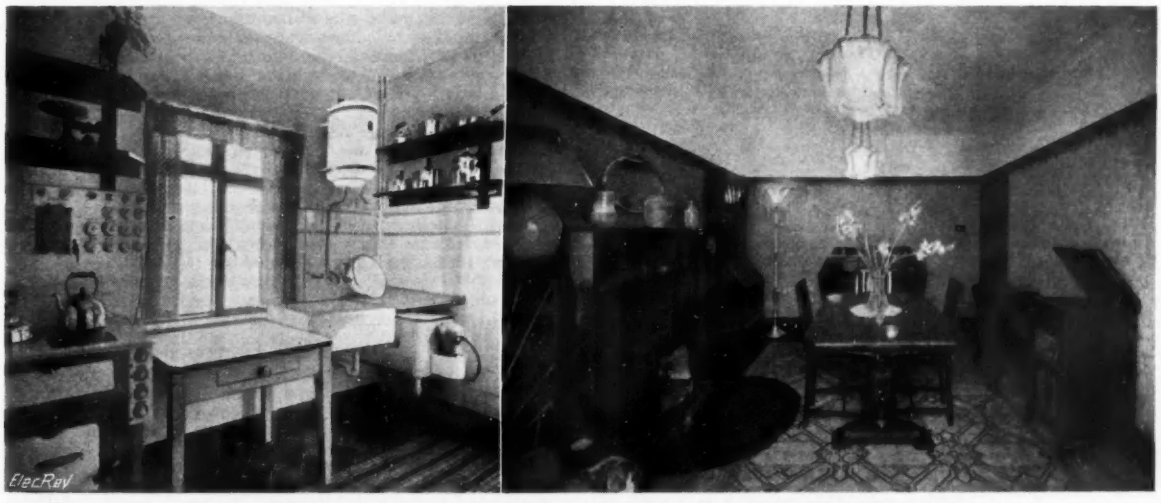
It will be seen that with the single exception of electric cooking ranges each of the scheduled items show a decrease.

B.I.F. as Trade Barometer

The extent to which the formation of the National Government is re-establishing confidence in the world of commerce and industry was suggested in a recent statement by Mr. C. Elliott, general manager of the British Industries Fair, Birmingham. According to the daily Press, Mr. Elliott said that at the height of the economy crisis a few firms actually withdrew their applications, but when a settlement was announced on August 24th the space booked during the week amounted to over 10,000 sq. ft., with the result that 200,000 sq. ft. in all was now definitely booked, leaving unlet about 40,000 sq. ft. only, of which a large amount was provisionally reserved.

Reduction in Swedish Exports

A large fall occurred in the value of goods exported from Sweden during the first half of this year. Among the items which contributed to this decrease were machinery and electrical apparatus, the exports of which declined in value from kr. 100.5 millions to kr. 68.3 millions, *i.e.*, from £5,500,000 to £3,750,000.



Views of the Model Kitchen-scullery and Dining-room at Electric House, Birmingham

The British Engineers' Association

A copy of the 1931 edition of the "British Engineers' Association Handbook of Members and Their Manufactures" has just come to hand. In its 264 pages the publication, in addition to giving a list of the members of the B.E.A., their addresses and products, contains details of the objects and activities of the Association and the specialised engineering services available to members. Within the next few weeks 5,000 copies of this handbook are to be sent to selected buyers of engineering products in the home and overseas markets, and copies will also be posted free of charge to anyone interested on application to the secretary of the Association, 32, Victoria Street, London, S.W.1.

Municipal Trading at Burnley

It was reported to Burnley Chamber of Trade on September 3rd that a meeting of electrical members, regarding the effect of municipal trading, did not produce any positive facts, but the electricians emphasised the disabilities under which they laboured. Following a friendly talk, it was decided to have a further conference at which representatives of every trade affected by municipal competition would be present.

Municipal Trading at Darlington

At a recent meeting of the Darlington Town Council Councillor W. G. Chandler protested against the continued activity of the Corporation Electricity Department showrooms in Skinnergate. He declared that the business done in competition with electricians had already put out of business two electricians in the same thoroughfare. There was enough competition amongst the tradespeople of the town to keep prices low without the Corporation going into business as well.

Mayor and Coulson's Jubilee Celebration

The jubilee celebration of Messrs. Mayor & Coulson took place last Friday night in the St. Andrew's Halls. There was a gathering of over a thousand employés and friends. Mr. Sam. Mayor, chairman of the company, who presided, was presented by Mr. G. C. Anderson, on behalf of the employés, with a portrait of himself in oils. In the course of his reply, he said that the position of industrial control in these years of great depression had many anxieties. One of the chief of these had been to maintain continuity of employment for the workpeople. Happily, his firm during recent years had been comparatively successful in that, partly because they were engaged in the production of a speciality for which there was a demand at a time when a demand in general engineering scarcely existed. He was glad to tell them that the firm had more work in hand at this moment than it had ever had before. Among other contracts, they had just booked the largest contract for conveyors for use underground in coal production that had ever been placed. With that and other work on order full employment was assured to all their employés for the ensuing winter. Mr. Archibald Boag also made a presentation of a dinner set to Mr. W. Arthur Coulson. After supper the large gathering enjoyed a capital entertainment programme as well as dancing.

The Timber Trade

Our Timber Trade Correspondent writes: The past month has been a quiet one for spot trading in European building and joinery woods, due to some extent to the holiday period, to bad weather for outside work, and to no small extent to the rather uncertain feeling occasioned by the financial and political events of recent weeks. The lighter imports that have helped to hold up the spot market are now giving way to receipts of larger volume, but, on the other hand, the outlook for a larger consumption is not bright. Those, therefore, in the buying market should find prices most reasonable, and this seems likely to be continued throughout the year. Indeed timber is so cheap that builders and municipalities ought to take advantage for extensions—provided that the work is a paying proposition—rather than economise. The hardwoods in log form from Empire and foreign countries are in very small request, and imports are on a similar scale, but the sawn varieties are increasing in stock, whilst demand shows little, if any, progress. The plywoods are not in such large supply owing to the cautious policy of British importers in their buying commitments this year.

The Swedish Flashlamp Market

The *Chamber of Commerce Journal* reports that Sweden, and especially, Southern Sweden, offers a fairly good market for flashlamps, the most popular being the flat type, although the cylindrical lamps are purchased to a certain extent. The flat type with room for the 4½-volt three-cell battery has by far the greatest sale. Ordinary lenses are preferred, but long range focusing equipment is coming more into favour. The cases are generally made of nickel-plated or black sheet metal, fibre, or paper, but leather and imitation leather cases are also to be seen. German batteries are much in evidence, but there have been complaints as to inferior quality. Danish batteries are favoured owing to their high quality, Sweden buying about 30 per cent. of Denmark's total exports of dry cell batteries.

Price Reductions

Messrs. KORTING & MATHIESEN ELECTRICAL, LTD., announce a reduction in the price of "Kandem" floodlight projectors.

An Electrical Company's Diamond Jubilee

This year is celebrated the diamond jubilee of Messrs. William Geipel, Ltd., and there are few concerns existing to-day with so lengthy a continuous history in the electrical industry. The business was established in 1871 by Edward James Paterson at Bedford Court, Covent Garden, and for several years was carried on at this address, but later at Little Britain, Aldersgate Street, in the making and selling of electric bells, indicators, batteries, etc. Then Mr. Paterson took into partnership Mr. Charles F. Cooper, and with his advent the European Telegraph Works, at Dalston, previously acquired, were equipped for the manufacture of dynamos and other heavy electrical plant. Much valuable work in dynamo design was done from 1884 onwards, and in the days when arc lighting was at its height the making of arc lamps and apparatus formed a large part of the business. In May, 1897, Mr. William Geipel joined in partnership the late Mr. F. M. T. Lange, and together they acquired the contracting and agency departments of the business, which they continued under the new firm of Geipel & Lange. During the first few years of the present century the firm began its gradual return to the ranks of electrical manufacturers, until to-day again its main interests lie in manufacturing just as they did sixty years ago. In 1906 Mr. Lange retired from the partnership, and the firm was carried on by Mr. Geipel under the name of William Geipel & Co. Four years ago, in 1927, the works and offices were moved to 156-170, Bermondsey Street, and the business was formed into a private company, registered under the name of William Geipel, Ltd.

Willesden and Michael Faraday

In connection with the Faraday Centenary Celebrations, the Electricity Department of the Willesden Urban District Council has decided, in addition to floodlighting the important buildings, to organise an electrical exhibition, principally composed of apparatus made in the district. The Drill Hall, Pound Lane, N.W.10, has been placed at the disposal of the committee, and Sir John Brooke, vice-chairman of the Electricity Commission, has promised to perform the opening ceremony at 3 p.m. on Monday, September 21st. The exhibition will be free and open each day, after the first day, from 10 a.m. to 10 p.m. until Saturday, September 26th.

Catalogues Required

Messrs. M. & C. SWITCHGEAR, LTD., Kelvinside Works, Kirkintilloch, Glasgow, who are now established in their new premises, ask for catalogues and lists of switchgear, cables, and accessories.

Recent Contract

STANDARD TELEPHONES & CABLES, LTD., have received the contract for relaying the speeches and music by means of their public-address system during the Faraday Centenary Exhibition at the Royal Albert Hall.

"H.M.V." Special Products Exhibition

An interesting exhibition and demonstration was given last week at Radio House, Tottenham Court Road, London, W.1, by "His Master's Voice" Special Products Branch of the Gramophone Co., Ltd. This new Branch has recently been formed to supply specially designed and constructed sound-amplifying, transmitting, and reproducing installations for commercial, industrial, and utility purposes; it acts, in fact, as the Engineering Contracts Department, or "jobbing" department, for the Gramophone Company, and also for the Marconiphone Co., Ltd. Perhaps the most interesting piece of apparatus demonstrated was the "Model P. 15" amplifier, a "super-power" instrument having an undistorted output of 125 watts. A portion of its output was fed to the company's "Searchlight" loud-speaker, which is claimed to be the largest moving-coil cone-driven speaker yet constructed. This loud-speaker is capable of radiating intelligible speech a distance of three miles under favourable conditions, but as it was not possible to demonstrate its sound-radiating properties in the small space available, the main portion of the output of the amplifier was diverted to an ordinary 100-V incandescent lamp. When music was played from a record, sufficient audio-frequency power was generated in the output stage of the amplifier to illuminate the lamp. Much attention was also shown in a demonstration of the electrical reproduction of music, crowd noises, and sound-effects by means of the "610 A" reproducer, which has been specially developed for cinema, theatrical, and public entertainment purposes in general. Among other exhibits of note were portable public-address amplifiers, portable electric reproducers constructed to meet customers' special requirements, radio relay equipment, photo-electric cells, a talking automaton for advertisement purposes, and an automatic weighing machine which shouts out the weight.

New Swiss Companies

Among the new concerns recently organised in Switzerland are the Wasseramt Elektrizitatsverband, Kriegstetten, to supply electricity in the Solothurn Canton; the Apparat Gesellschaft, Basle (23 St. Jacobstrasse), to manufacture electrical apparatus; the Adolf Baier Elektromaschinenbau Gesellschaft, Birsfelden, to acquire and extend the Baier electrical engineering works in that town; and the Société des Machines Electriques Modernes "Menisa," Geneva (10 Avenue Gallatin).

New Traffic Signal

Patent rights have been granted to three employés of the Automatic Telephone Manufacturing Co., Ltd., for a new type of automatic street traffic control signal. The system, an example of which is at the Norton Street-Islington crossing, is distinctly novel, the usual motor-driven controller being entirely dispensed with. The mechanism by which the red, green, and amber signals are displayed is an adaptation of that used in the Strowger automatic telephone exchanges equipped by the company, and installations are pending also in Bootle, Southport, Peterborough, and elsewhere.

British Insulated Boy Scouts

The accompanying illustration shows Mr. G. H. Nisbett, managing director of British Insulated Cables, Ltd., inspecting the B.I. troop of boy scouts, prior to their going to

camp. The troop was formed about eighteen months ago and numbers about 120. During the past few months a drum and fife band of twenty-five members has been formed.

E.D.A. (Northern Counties Area) Luncheon

About 160 members of the Northern Counties Area Committee of the British Electrical Development Association attended a luncheon given at Carlisle by the Mayor of Carlisle at the Crown and Mitre Hotel on Thursday, September 3. Among those present were: Mr. A. C. Cramb, director of the B.E.D.A.; Mr. E. L. Beck, chairman of the Northern Counties Area Committee; Miss N. Balls, Tynemouth, chairman of the North-Eastern District of the E.A.W.; Mr. C. W. Salt, electrical engineer to the Carlisle Corporation; Mr. C. H. and Lady Cecilia Roberts, Mr. and Mrs. J. R. Potts, Mr. and Mrs. T. G. Charlton, and Mr. A. Parkin, Northern Counties Area officer. Mr. C. W. Salt, who gave an interesting address concerning electrical development, said that they met on the eve of the Faraday Centenary, and pointed out that Faraday's discovery was the starting of a phenomenal development of such machinery, plant or apparatus as was necessary to make electrical energy of useful service to mankind and had probably had more effect in improving the amentities of life than any other one discovery. Mr. A. C. Cramb congratulated Carlisle on extending its electricity service into the rural areas. The towers of the national scheme were a thing of beauty compared with petrol stations and other ancient and modern creations. If people only half appreciated the great advantages of electricity there would never be another word said against the towers. Miss N. Balls also addressed the gathering. Many of the visitors afterwards visited the Carlisle electricity station.

The " Model Engineer " Exhibition

More interesting than usual is the annual exhibition organised by the *Model Engineer*, which is now being held at the Royal Horticultural Hall, Westminster, S.W. Interest is taken in the exhibition all over the world, and entries for the competition section have been received from Canada and the United States. A diversity of subjects has been chosen as models by the competitors for the Championship Cup. Locomotives, ships, automobiles and aeroplanes, as usual, hold the field for popularity, but an increasing interest seems to be taken in electrical apparatus. One very ingenious exhibit is a working model of an electric motor just the size of a postage stamp, while another excellent piece of work is an electrically-driven grandfather clock. Amongst the apparatus on loan is a short-wave, stenode, 7-valve super-heterodyne radio receiver which is well worth inspection. In the trade section, in addition to a complete display of tools and materials, a number of items of particularly electrical interest are being shown. On the stand of Messrs. W. T. Henley's Telegraph Works Co., Ltd., are to be seen demonstrations of the " Solon " electric soldering iron, while the Queen's Engineering Co. is exhibiting examples of small electric lighting sets, motors for workshop or model driving, electric lathes, &c. Small electric motors and generators, battery-charging sets, electric drills, grinders, pumps, fans and lathe tools, comprise the exhibit of Messrs. René Volet, Ltd. Messrs. Will Day, Ltd., are showing a quantity of radio and sound-producing apparatus. One particularly interesting model is being exhibited by the British Model Theatre Guild to illustrate the three-colour (red, green, and blue) system of lighting a cyclorama. At the opening of the exhibition last week Sir Felix Pole, president of the Society of Model and Experimental Engineers, spoke of the value of models in the engineering industry for testing and perfecting new ideas, and for demonstrating the principles of new inventions. The transport problems of railways throughout the world, he said, urgently called for the extended use of electricity, and he was sure that model engineers were watching developments in this respect. It might well be that the electric locomotive of the future would be influenced by model makers as the development of the steam locomotive has been.

The exhibition closes to-morrow.

New French Companies

Among the new companies recently formed in France are the Société Pyrenéene d'Electrochime, Paris (9, Rue Louis Murat), with a capital of £248,000, to manufacture electrochemical products; La Société Hartmann & Braun, Paris (56, Rue du Faubourg Saint Honoré) to undertake the sale of Hartmann & Braun electrical instruments in France; La Compagnie Parisienne des Projecteurs, Paris (49, Boulevard Gouvion-Saint Cyr), to manufacture electric headlights for all purposes; La Société des Transformateurs de Mesure E. Walter, Gentilly, Seine (64, Avenue du Docteur Durand), with a capital of £16,000, to manufacture metering transformers and other electrical apparatus; and La Société des Teleimprimeurs, Paris (1, Rue Taitbout), £20,000, to manufacture telegraphic printing apparatus.

Proposed Increased Duties for Costa Rica

According to the *Board of Trade Journal*, H.M. Consul at San Jose reports that proposals are under consideration for an increase in the customs duties on certain goods imported into Costa Rica. The goods affected include wireless apparatus.

Equipment of Johannesburg's New Station

Several points of interest are to be noted in connection with the equipment of the new generating station at Johannesburg, now nearing completion. All the offices and corridors are to be lighted through diffused glass fittings, and floodlights operated from the top of the building light up the baggage quadrangles. For the concourse, dining and waiting rooms, and refreshment rooms, specially designed fittings will be used which harmonise with the general architectural effect, the lights in the concourse being operated automatically by time switches. A sub-station will supply power to all the station lifts, of which there will be three for passengers, five for baggage and parcels, two for books and one for bullion. All the lifts will be provided with both pilot and push-button-control systems. All cooking appliances in the kitchen and elsewhere will be electrically operated, including the tea and coffee urns, cocktail shakers and refrigerators. The station will be equipped with eighty clocks, all controlled by electricity from a master clock. The hot water for heating the building will be circulated by electrically driven pumps, and the machines of the ticket-printing department in the basement will also be electrically driven.

" Ediswan " Lamp Publicity

We have received from the Edison Swan Electric Co., Ltd., a quantity of literature, together with details of a poster, window displays and centrepiece, which has been

An Attractive " Ediswan " Centre-piece

prepared in connection with the " Ediswan " lamp campaign for the coming season. The window displays, which are available to the trade, are made up of the cartons of " Royal Ediswan " lamps with an attractive centrepiece (shown above) in the form of a jewel case illuminated from the rear. In addition, new types of box signs of a striking design are available, suitable for both day and night displays.

Czecho-Slovakian Electrical Exports

The *Board of Trade Journal* reports that the exports of electrical machinery and apparatus from Czecho-Slovakia for July reached a value of 12,679,000 crowns, while for the period January-July the exports totalled 56,125,000 crowns.

Book Notices

"Aluminium in Electrical Engineering." Pp. 35; illustrated fully. London: British Aluminium Co., Ltd.—This informative booklet, being a reprint of a lecture by Mr. E. T. Painton, does not attempt to describe in detail individual applications of this metal and its alloys, which are multitudinous in our industry; it states the general principles underlying the choice of these metals in all applications.

"Electricity and Magnetism for Higher School Certificate and Intermediate Students," by S. G. Starling. Pp. vii+345; figs. 254. London: Longmans, Green & Co., Ltd. Price 6s. net.

"Vector Representation for Electrical Metermen," by D. T. Canfield. Pp. xi+180; figs. 59. London: McGraw-Hill Publishing Co., Ltd., Price 10s. net.

"Economics for Engineers," by E. L. Bowers and R. H. Rowntree. Pp. viii+490; figs. 43. London: McGraw-Hill Publishing Co., Ltd. Price 20s. net.

"From Telegraphy to Television," by Lt.-Col. Chetwode Crawley. Pp. xii+212; 44 illustrations. London: Frederick Warne & Co., Ltd. Price 6s. net.

"Polyphase Induction Motors," by Louis Lagron. Pp. xiv+218; figs. 132. London: Blackie & Son, Ltd. Price 15s. net.

For Sale

A stock of electrical and wireless goods is to be sold by auction on September 16 by Henry J. Shaw at 13, High Holborn, W.C.1.

Messrs. Fuller, Hall & Foulsham invite tenders for the plant, stock, etc., of Metalcraft, Ltd., electrical fittings manufacturers, at 6, Windmill Street, London, W.1.

(See our advertisement pages to-day.)

Scottish Radio Exhibition

The second exhibition of the Scottish National Radio Association is to be held at the Waverley Market, Edinburgh, from November 11th to 21st.

Social Events

Over 2,500 people were present at the 15th annual Horticultural Show and Garden Party organised by the Clesco (County of London Electric Supply Co. and Associated Companies) Sports and Social Club held at Raynes Park on August 29th in ideal weather. The entries for the exhibition were of a very high order, both as to quality as well as quantity. The prizes were presented by Mrs. Brand, wife of Mr. Charles J. Brand, J.P., a director of the company. There were also present Mr. Robert Renwick, accompanied by Mrs. Robert Renwick, and Sir Thomas Bethell, with Lady Bethell, and Miss Renwick, daughter of the chairman. Music was supplied by the well-known broadcasting combination of Callenders Cable Works Band during the afternoon and an entertainment by the "Pomposities" concert party followed the tea interval. Amusement for the children was provided by a Punch and Judy Show and Wilkins & Chant Living Marionettes. Open-air dancing and an excellent firework display concluded an enjoyable day.

Henley's Sports Club held its thirteenth annual sports on the sports ground at Craggs Farm, Singlewell, Gravesend, on August 29th, the event being favoured with fine weather. The events were carried through without pause, and the interest of the large number of spectators who were present was continuously maintained. The organisers and officials are to be congratulated on their excellent management of an afternoon's first-class entertainment. The accompanying illustration shows Mrs. Wright, the wife of the club's president and Henley's works manager at Gravesend, presenting the prizes, with Mr. R. O. Wright standing by her side.

The prize presentation at Henley's sports

New Catalogues and Lists

BRITISH INSULATED CABLES, LTD., Prescot, Lancs.—A leaflet (P.F.82) relating to "Prescot" foundry paint.

The WARDLE ENGINEERING CO., LTD., Old Trafford, Manchester.—Publication L.556 illustrating and describing "Wardle" floodlight projectors.

The EDISON SWAN ELECTRIC CO., LTD., 23-25, Queen Victoria Street, London, E.C.4.—A complete catalogue (L.702) of "Royal Ediswan" lamps, together with discount tables. The range covered includes all types of lamps for domestic and industrial purposes, as well as traction, miners', sign and decoration lamps. Also a quantity of other literature relating to the 1931-32 lamp season.

The CLARMAC ENGINEERING CO., LTD., 48, Payne Street, Port Dundas, Glasgow.—Publication No. C.2, in which "Clarmac" switchboards are illustrated and described.

ALAN WRIGHT, 117, Victoria Street, London, S.W.1.—List AS/1/31, dealing with "Inventum Condensacone" water heaters, which have been designed especially for use in districts where the water is exceptionally hard.

The ENFIELD CABLE WORKS, 296/302 High Holborn, London, W.C.1.—A blotter, indicating the method of packing "Enfield" cables.

STERNOL, LTD., Royal London House, Finsbury Square, London, E.C.2.—A circular letter and a leaflet indicating the use of "Cooloricid" for hot bearings.

The VIDAL ENGINEERING CO., LTD., Thornton Road, Croydon.—A folder relating to "Vidal" portable electrical drills, grinders, polishers and other portable tools and accessories. A reduction of 12½ per cent. in prices is announced.

The IONIC ALKALINE BATTERIES, LTD., 26, High Street, Stratford, London, E.15.—A folder illustrating and describing the "Ionic" electrical hand lamp, fitted with alkaline all-steel accumulator.

The SHOREDITCH WOOD TURNING CO., LTD., 27, Horsell Road, Drayton Park, Holloway Road, London, N.5.—A wholesale net price list of lamp stands and table lamps in oak, mahogany, walnut, lacquer and cellulose finish, etc.

BRITANNIA BATTERIES, LTD., 233, Shaftesbury Avenue, London, W.C.2.—An illustrated booklet entitled "Achievement," giving in pictorial form the story of a tour of the Britannia Works at Redditch.

SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38-39, Upper Thames Street, London, E.C.4.—The new season's electric lamp catalogue (No. 500), together with a number of lamp leaflets which the company overprints for the trade.

FEED WATER SPECIALISTS CO., St. Paul's Square, Liverpool.—A diary for September and October, containing notes and tables on sampling water for analysis, thickness of pipes, feed water consumption, &c.

BUTTERWORTH BROTHERS, LTD., Newton Heath Glass Works, Manchester.—A catalogue giving prices, illustrations, and particulars of the company's extensive range of glass goods, which include all kinds of gauge tubes, protector glasses, lubricators, industrial and illuminating glassware.

BAXTER & CAUNTER, LTD., 221, Tottenham Court Road, London, W.1.—Catalogue No. 61, illustrating and describing the new season's electric fires, lighting fittings, reflectors, motors, domestic appliances and electrical accessories generally.

The IGRANIC ELECTRIC CO., LTD., 149, Queen Victoria Street, London, E.C.4.—Advance information relating to a number of price reductions, together with particulars of new "Igranic" products to be introduced during the 1931-32 season. Also leaflet No. 1,045, dealing with self-acting starters for polyphase squirrel cage motors.

SUPERLAMP, LTD., 92-94, Paul Street, Great Eastern Street, London, E.C.2.—A leaflet giving particulars of new lighting units, panel fittings, irons, vacuum cleaners, &c.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.—The new season's price list (O.S.5946) of "Osram" electric lamps. Also leaflet X.5944 describing the "D.B." cooker control switch.

BEST & LLOYD, LTD., Handsworth, Birmingham.—An illustrated catalogue (No. 182) of the latest types of "Best" electric fires.

The HART ACCUMULATOR CO., LTD., Stratford, London, E.15.—A booklet giving particulars and prices of the "Safetylite" system of emergency electric lighting for cinemas, theatres, hospitals, ships, &c.

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Holborn Viaduct, London, E.C.1.—Two leaflets, entitled "A Profitable Pastime" and "Do Your Soldering Electrically," in which are given particulars of the "Solon" electric soldering iron, together with a number of hints on soldering generally.

WILLIAM GEOCH & CO., LTD., 46, Coventry Road, Birmingham.—A leaflet describing the company's new tubular lighting fittings.

A. W. BEUTTELL, LTD., 96, Victoria Street, London, S.W.1.—List No. 30, giving full details of "Linolite" strip reflectors for all concealed lighting purposes. A reduction in price is announced on the "P.L." picture reflector.

PARTRIDGE, WILSON & CO., Davenset Works, Evington Valley Road, Leicester.—An illustrated catalogue dealing with "Davenset" commercial accumulator charging plants. Particulars of a new range of automatic chargers are included.

THE MULLARD WIRELESS SERVICE CO., LTD., Mullard House, Charing Cross Road, London, W.C.2.—Two coloured window strips relating to the company's valves and radio receivers.

Italian Duties on Aluminium Raised

The *Board of Trade Journal* states that the Italian Government has increased the rates of import duty upon aluminium and aluminium products. The duty on ropes and cables of aluminium and its alloys has been raised from 367 to 650 paper lire per 100 kg.

Bankruptcy Proceedings

Harden & Chinery (W. G. Harden and C. H. Chinery), electrical and mechanical engineers, 7, Barnsbury Street, Islington, N.—The accounts under this failure showed liabilities of £4,352, against assets £165. The following are creditors: Ashwell, G., £773; British Thomson-Houston Co., Ltd., £19; Coquanton, H. C., & Co., Ltd., £291; Chinery, W., £2,441; Johnson & Phillips, Ltd., £88; Leydon, Sargeant, London, £240; Hackbridge Cable Co., Ltd., £126; Williams, V. E., £44. Partly secured creditors: Falk Stadelmann & Co., Ltd., London, £239.

E. T. Colley (Central Radio Co.), electrical accessories salesman, 17, Dimsdale Parade, Wolstanton.—First meeting held September 8th. Public examination, October 8th, at the Town Hall, Hanley, Stoke-on-Trent.

R. E. Pearcey, electrical engineer, 105, Arthur Street, Withernsea.—First meeting held September 9th. Public examination, October 12th, at the Guildhall, Alfred Gelder Street, Hull.

J. P. Hayes (Evening World Radio-Gram Stores & Service), radio electrician, 17, Lawrence Hill, Bristol.—Trustee, Mr. A. H. Ward, 26, Baldwin Street, Bristol, Official Receiver, released July 24th.

R. J. Irving, wireless dealer, 4, Bridge Road, Kirkstall, Leeds.—Trustee, Mr. H. C. Bowling, 24, Lower Bond Street, Leeds, Official Receiver, released July 27th.

G. Blackmore, wireless engineer, 62, Coventry Road, Market Harborough.—Trustee, Mr. E. Barlow, 1, Berridge Street, Leicester, released July 30th.

J. Littler, electrical and radio engineer, 5, Lansdowne Road, Southport.—Trustee, Mr. A. T. Eaves, 47, Moseley Street, Manchester, released July 29th.

T. Barnett, electrical contractor, 934, Woodborough Road, Mapperley, Nottingham.—Trustee, Mr. R. B. Rhodes, 18, Low Pavement, Nottingham, released July 24th.

F. V. Howitt (The Falksley Co.), electrical engineer, Riste's place, Barker Gate, Nottingham.—First and final dividend of 2s. 8¾d. in the £, payable September 15th at the Official Receiver's offices, 22, Regent Street, Park Row, Nottingham.

H. E. Sandell, electrical engineer, 1, Sandpit Lane, St. Albans.—Last day for receiving proofs for dividend, September 18th.—Trustee, Mr. J. L. Poland, 29, Russell Square, W.C.

T. W. B. Durant, electrical and motor engineer, Coit Lane, Chapeltown, near Sheffield.—Supplemental dividend of 6¾d. in the £, payable September 4th at the Official Receiver's office, 13, Burton Street, Wakefield.

H. Turner, radio and electrical contractor, 20, Battersea Rise, Clapham Common, S.W.—First and final dividend of 4½d. in the £, payable September 17th at the Official Receiver's office, 29, Russell Square, W.C.

Company Liquidations

Eltax, Ltd., Hayden's Place, Portobello Road, London, W.—The statement of affairs filed in this compulsory liquidation discloses ranking liabilities £7,192 and net assets nil.

Creditors:—

	£		£
Bush, Beech & Gent, Ltd.	49	Eltax Electric, G.M.B.H.	3,663
Binnke, H. A., G.M.B.H.	2,794	Electro Schweisswerk ...	60
Camden Cardboard Co.	41	Hillbar Press, Ltd. ...	84
Cundell, Eve & Co., Ltd.	30	Langham Electrical Co. Ltd.	115

World's Supplies, Ltd., 18, Church Road, Leyton, N.E.—The statement of affairs filed in the compulsory liquidation of this company shows total liabilities £3,143, of which £2,800 is unsecured, assets £552, and as regards shareholders a deficit of £3,497.

The following are creditors:—

	£		£
Abingdon Wireless Co.	90	London Valve Co. ...	129
Brander & Davies Agency, Ltd.	53	Mullard Wireless Co. ...	194
British Battery Co. ...	84	Octron, Ltd.	113
Bennett & Co., T. & W.	51	Odhams Press, Ltd. ...	115
Clinton Manfg. Co. ...	401	Rose & Son, T. A. ...	62
Cosser & Co., Ltd., A. C.	125	Six Sixty Radio Co., Ltd.	60
Concerton Radio Co. ...	184	Tepada Radio & Elec., Ltd.	214
Edwards, F.	330	Tungsram Elec. Co. ...	137
General Electric Co., Ltd.	64	Warner, L. E.	55
Garnett, Whitsley & Co., Ltd.	89		

Gascoigne Insulating Co., Ltd.—Winding up voluntarily. Liquidator, Mr. R. H. A. Neuschild, 49, Moorgate, E.C.

Hydro-Electric Power & Public Service Trust, Ltd.—Winding up voluntarily.—Liquidator, Mr. C. Reid, 1, Leadenhall Street, E.C.

Furnace Electric Heating Co., Ltd.—Winding up voluntarily. Liquidator, Mr. C. Peckett, 22a, Commercial Street, Halifax.

Martins (Heckmondwike), Ltd.—Winding up voluntarily.—Liquidator, Mr. C. D. North, Hanover Street, Batley.

Stableford & Co., Ltd.—Meeting, October 6th, at 5, London Wall Buildings, E.C., to receive an account of the winding-up by the liquidator, Mr. R. Kettle.

Dissolution of Partnership

Marston Electric Co., electrical engineers, Station Road, Marston Green, Warwickshire.—Mr. H. Buckley and Mr. J. P. Knight have dissolved partnership.

Prentice & Broan, electrical engineers, 901a, Fulham Road, S.W.—Mr. D. W. J. Prentice and Mr. H. W. Broan have dissolved partnership. Mr. Broan will attend to debts and carry on the business and Mr. Prentice will carry on the business of electrical engineer on his own account at 29, Fabian Road, Fulham, S.W.

Electricity Supply

Lighting, Domestic, Power

Aberdeen.—YEAR'S WORKING.—Mr. J. A. Bell, the city electrical engineer, in his annual report to the Corporation Electricity Committee, states that the sum of £13,862 was spent during the year out of the reserve fund, the chief items being for the renewal of accumulators and the reconditioning of e.h.p. switchgear. Reductions in the charges for electricity and a decline in the number of motors hired caused a reduction of £30,200 in the total revenue. There were 1,640 new consumers added during the year, 145 of these being in the county area; the total number of consumers now connected is 16,274.

Ashington (Northumberland).—STREET LIGHTING.—The Urban District Council is to consider tenders for street lighting.

Australia.—LACK OF FUNDS DELAYS ELECTRICITY SCHEMES.—Owing to lack of funds the Victorian Electricity Commission is unable to proceed with its scheme for the extension of its Yallourn-Castlemaine ring main to Bendigo. For the same reason the Commission is compelled to postpone the reconstruction or repair of the Bendigo tramway tracks.

Birkenhead.—LOANS SANCTIONED.—The Corporation Electricity Committee has obtained sanction to the borrowing of £40,000 for the assisted wiring scheme, £2,623 for the provision of Swan Hill sub-station, and £15,571 for mains and sub-station equipment.

Canada.—THE AVAILABLE POWER RESOURCES.—The most recent analysis of power figures by the Dominion Water Power and Hydrometric Bureau of the Department of the Interior places the available water-power throughout the Dominion at 20,347,400 h.p. for conditions of ordinary minimum flow and 33,617,200 h.p. ordinarily available for six months of the year. This analysis takes account of every known rapid, fall, and power site, but cannot be taken as final because there are, particularly on the northern rivers, rapids and falls concerning which there are insufficient data upon which to base estimates of power. In addition, there are opportunities of securing economic heads on rivers of gradual gradient, or possible storage and diversion opportunities which cannot be appraised until detailed field surveys have been made.

ELECTRIC PLANT WRECKED AT MONTREAL.—*The Times* states that notwithstanding the fact that the strike of linesmen of the Montreal Light, Heat and Power Company has been called off, the wrecking of plant of power companies in the Montreal area continues. Two towers of the Shawinigan Company, on the outskirts of Montreal, have collapsed after explosions of dynamite at their bases. Electricity and telephone services were interrupted, and the highway was blocked.

Carlisle.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains at a cost of £1,050.

LOAN SANCTIONED.—Sanction has been obtained to a loan of £5,000 for the purchase of meters.

Continental.—GERMANY.—Unemployment is so bad in Barthau that the town has been unable to pay for its electricity bills since June. The supply has accordingly been cut off by the Chemnitz Electricity Supply Co.

ITALY.—According to *L'Energia Elettrica*, the capacity of the electric power stations in operation in Italy at the end of June last amounted to 4,355,000 kW, as compared with 4,142,000 kW at the corresponding date of 1930, an increase of 5.14 per cent. Of the total, hydro-electric plants are responsible for 3,586,000 kW, and steam and internal-combustion engine stations for 769,000 kW. The output of electricity in Italy during the six months ended June last is estimated at 4,680,613,000 kWh, as against 4,931,014,000 kWh in the corresponding six months of 1930, a decrease of 5.08 per cent.

Crewe.—LOANS.—The Town Council has received sanction to loans of £21,660 for mains and services and £1,624 for meters.

Dartford.—EXTENSIONS.—The Urban District Council Electricity Committee has obtained sanction to a loan of £4,450 for mains extensions to Baldwyns estate and the erection of a sub-station.

Doncaster.—LOAN.—The Town Council has applied for sanction to a loan of £25,000 for mains and services for the next 2½ years.

Dundee.—ELECTRICITY SUPPLY.—The town was last week connected up with the Central Electricity Board's system, and the Carolina Port station has been temporarily shut down.

Eastbourne.—SUPPLY TO THE WEALD COMPANY.—At a recent meeting of the Corporation Electricity Committee, Mr. S. J. Watson, the Central Electricity Board's district engineer for south-east England, outlined the position with regard to supply to the Weald Electricity Supply Co., Ltd. He stated that the Weald Co. approached the Board in May for a bulk supply, and he wished to know if the Corporation would agree to its "breakdown" station at Hailsham being jointly used to supply the Corporation and the Weald Co., the expense in

connection with the service charge, transformers, foundations, etc., being halved. The Committee declined to agree to the suggestion.

Federated Malay States.—POWER STATION IN MALACCA JUNGLE COMPLETED.—The construction of a 20,000-kW power station for the working of the tin mines on the Malacca peninsula, constituting one of the largest sources of revenue of the Malay States, has now been completed under the direction of a group of Swedish engineers. Owing to the general economic depression, however, only a third of the output of the new station can at present be utilised.

Glasgow.—ASSISTED WIRING.—At a recent meeting of the Corporation Electricity Committee, Mr. Herbert Bell (manager) submitted a report with regard to the schemes of hire-purchase wiring for domestic premises at present in operation. After discussion the Committee agreed to recommend that the present schemes, which are for periods of three years and ten years, should be discontinued and that a new scheme for a period of five years be inaugurated. It is proposed that the new scheme should not be applicable for houses having more than four apartments. In his report the manager stated that the total outlay incurred by the Department on hire-purchase installations at May 31st last was £283,746, of which slightly under half has been repaid by the purchasers. The total bad debts incurred to date amounted to £811.

MAINS EXTENSIONS.—Mains extensions costing £3,877 are to be carried out by the Electricity Committee.

India.—The HOOGHLY TUNNEL.—The cable tunnel under the Hooghly River, which has just been completed by the Calcutta Electric Supply Corporation, is an outstanding achievement, and is the first shield-driven iron-lined tunnel ever constructed under a large tidal river in the East by the compressed-air methods. In the construction of the tunnel British supervision was provided throughout, but Indian labour alone was employed, and adapted itself readily to the work. The supervising staff suffered much from the heat and humidity in the tunnel, particularly during the rainy season, when the temperature at times rose to 90 degrees F. with 100 per cent. humidity. The crown of the tunnel is 36 feet below the bed at the deepest part of the river, and 15 feet below the level of the deepest known scour. The air pressure varied from 25 to 46 lb. per square inch, and at times had to be such as to balance the tidal head in the river. The new tunnel has been constructed for the purpose of providing for the growing consumption of electricity in the important residential and industrial area in the south of Howrah, on the right bank of the Hooghly.

Irish Free State.—CORK.—The County Council has decided to raise a loan of £1,500 for the installation of electric lighting at the Fermoy County Hospital.

Maidstone.—LOANS.—The Town Council has applied for sanction to loans amounting to £12,620 for transformers, switchgear, and buildings.

Manchester.—ELECTRICITY SUPPLY.—The Corporation Electricity Committee is to acquire land in King Street, Ardwick, primarily for electricity purposes. Ultimately the land will be required as a site for receiving the main transmission lines from the proposed Carrington power station, and will accommodate the necessary large step-down transformers. Meanwhile the land and part of the sub-station will be used to effect certain economies in the existing h.p. transmission system, and a portion of the site is needed immediately for a small distributing station on the l.p. mains network.

Motherwell.—BULK SUPPLY.—The Corporation Electricity Committee has received a letter from the Clyde Valley Electrical Power Co. offering to supply electricity in bulk for the Flemington sub-station and to provide and equip two feeders and one transformer panel. The charge would remain as at present, the maximum demand being combined with the demands of existing supplies. The Committee recommends that an agreement should be concluded with the company on the terms outlined.

Newcastle-under-Lyme.—CHANGE-OVER.—The Town Council is to apply to the Electricity Commissioners for sanction to change-over the system of electricity supply from d.c. to a.c. on the Hill Farm, Roe Lane Farm, Seabridge Road Farm, and Clayton Road Farm estates.

Newcastle-upon-Tyne.—CHANGE-OVER ARRANGEMENTS. — At a recent meeting of the City Council Mr. J. A. Clydesdale asked what steps had been taken by the Parliamentary Committee to make arrangements with the Newcastle & District Electric Lighting Co., Ltd., similar to those entered into with the Newcastle Electric Supply Co., Ltd., as to changing over from d.c. to a.c., and also what had been done in connection with the date of the next option of the city to purchase the undertaking of the Newcastle Electric Supply Co. In reply, Sir George Lunn, chairman of the Parliamentary Committee, said that no steps had yet been taken with the Newcastle & District Electric Lighting Co., Ltd., in regard to the change-over. A.c. was supplied in outlying districts and d.c. in the central area. The change-over in the central area would be very expensive, and, further, the network in that area was in excellent order and had the support of the Central Electricity Board. The date of the option had not been considered yet as it would not affect them until July, 1932.

Portuguese East Africa.—PROPOSED NEW PLANT FOR BEIRA. —Mr. A. E. Val Davies, the Johannesburg consulting engineer, who has been inspecting the electricity supply system at Beira on behalf of the municipal authorities, recommends the installation of a completely new plant at a cost of £72,000. At present the existing gas-engine plant is being duplicated at a cost of £7,500, but Mr. Davies estimates that the larger scheme is absolutely necessary if the anticipated development of electricity consumption during the next twenty years is to be properly catered for. The scheme proposed by Mr. Davies involves the construction of a new generating plant at Manga, and the conversion of the existing station into a sub-station.

Preston.—YEAR'S WORKING.—There was a net deficiency of £35,580 on the Corporation electricity undertaking for the year ended March 31st last. Sales of electricity rose by 13 per cent. to £194,727, although receipts from power supplies fell from £46,791 to £42,061. Bulk supplies, mainly to local authorities, rose from £73,773 to £94,634. Consumers numbered 17,224, and electricity sold amounted to over 92 million kWh.

Sheffield.—LOANS SANCTIONED.—The Corporation Electricity Committee has obtained sanction to the borrowing of £9,495 for mains and £1,013 for plant for the Shiregreen housing estate; £4,000 for e.h.p. underground feeder mains; £2,070 for the change-over of apparatus on consumers' premises; and £820 for plant.

Shrewsbury.—YEAR'S WORKING.—The annual report of the Corporation Electricity Committee for the year ended March 31st last states that there was a total income of £27,344, an increase of £3,090 as compared with the preceding year. Working expenses (£17,514) showed an increase of £1,139, the gross profit amounting to £9,830. After providing for loan interest, sinking fund contributions, &c., there was a net profit of £1,792, which compares with £1,425 in 1929-30. Capital expenditure during the year amounted to £16,722, bringing the total now spent on the undertaking to £162,061. Electricity generated showed an increase of 507,828 kWh, equal to 17.7 per cent.

Southend-on-Sea.—BREAKDOWN.—A faulty cable from the County of London Electric Supply Company's generating station at Barking caused the failure of the electricity supply lasting nearly two hours last Sunday evening in the Southend and South Benfleet districts.

South Africa.—JOHANNESBURG.—For the supply of electricity for lighting and power at the new station at Johannesburg, now nearing completion, a sub-station has been erected and equipped in the east end of the gallery floor. At this sub-station the pressure will be reduced to 380 V for power and 220 V for lighting. H.p. switchgear has been installed, besides the l.p. switchgear, for controlling the supply to the building and to the automatic signals, which are also supplied from the sub-station. A stand-by battery has also been included.

LICHTENBURG.—After many months of negotiations the Town Council has decided to purchase the electric power plant owned by the Lichtenburg Lighting Co. for £7,000, subject to the consent of the Provincial Administrator. The company originally asked £13,000.

Stalybridge.—HARTSHEAD POWER STATION EXTENSIONS.—The Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board has decided to apply for sanction to the borrowing of £46,000 (in addition to the £130,000 already granted) for extensions to buildings and plant at the Hartshead power station.

Swansea.—LOAN FOR POWER STATION.—The Town Council is to apply for sanction to the borrowing of £1,391,630, the estimated cost of the large new generating station which is to be erected by the Corporation. The Unemployment Grants Committee is prepared to make a grant of 100 per cent. of the interest on the loan up to December 31st, 1934, and 50 per cent. of the interest after that date to March 31st, 1945, upon condition that the work is commenced by September 15th and completed within 3¼ years.

Taunton.—YEAR'S WORKING.—The Corporation Electricity Committee reports a net profit of £4,715 on the operation of the electricity undertaking for the past year.

Thornton-Cleveleys.—YEAR'S WORKING.—It was stated at a recent meeting of the Thornton-Cleveleys Council that the electricity undertaking had shown very satisfactory results for the past year. The consumers had reached the 2,000 mark, and there was a net profit of £984, which with the previous year's balance gave a credit balance of £1,371.

United States.—ELECTRICAL DEVELOPMENT IN SEATTLE.—The Seattle Light Department proposes to spend $4,352,972 on electrical development during the coming year.

Wakefield.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to the borrowing of £25,000 for mains and services.

Wokingham.—OVERHEAD LINES.—The Ministry of Transport has granted the application of the Thames Valley Electric Supply Co., Ltd., to erect overhead lines in the parishes of Twyford and Hurst.

Traction

Aberdeen.—YEAR'S WORKING.—The accounts of the Corporation Transport Department for the year ended May 31st record a total revenue of £260,979, an increase of £2,671 over the previous year's figure. The total number of passengers carried by the Corporation trams, 'buses and motor-coaches was 61,059,567, an increase of 806,310.

Accrington.—TRAMWAY ABANDONMENT.—The Minister of Transport has sanctioned the abandonment of the tramways on the Marquis Street-Whalley Road and Blackburn Road-Union Road routes.

PROPOSED JOINT 'BUS SERVICE WITH BLACKBURN.—A conference was held last week between representatives of the Accrington and Blackburn Corporations to consider the introduction of a joint 'bus service in place of the existing tramway service between the two towns. The agreement for the through-running of tramcars between the two boroughs has been terminated.

Ashington.—AUTOMATIC TRAFFIC CONTROL.—The Urban District Council has decided to approach the County Council, recommending that automatic traffic signals should be erected at the Grand Hotel Crossroads at a cost of £127.

Bradford.—PROPOSED REDUCTION IN TRAMWAY EMPLOYÉS' PAY.—An extensive economy move by the City Council includes the prospective reduction in the pay of the 2,300 Corporation tramway employés, the Tramways Committee having decided to appeal to the Joint Industrial Council to adjust the wages in accordance with the diminished cost-of-living index figure. The local branch of the National Transport and General Workers' Union is preparing to resist the proposed reduction.

Canada.—UNDERGROUND TRAMWAY FOR TORONTO.—Plans for underground tramcar tracks in Yonge Street, one of the main traffic arteries of Toronto, are being considered by the civic authorities. The tracks would be sunk beneath the level of the street and roofed over, leaving the full width of the street for motor traffic. The scheme is distinct from an underground system such as exists in London. The cost of the undertaking is estimated at £1,200,000.—*Reuter.*

Carlisle.—ELECTRIC TRAFFIC CONTROL.—The Corporation is to consider the advisability of installing electric traffic signals.

Continental.—BELGIUM.—The Belgian Minister of Transport has recently made an inspection of the electric railway between Rotterdam and Amsterdam. It is believed that the visit was made in connection with the plan for the electrification of the Belgian railways, particularly the line between Brussels and Antwerp. A scheme has already been prepared for the conversion of the latter line at an expenditure of 118,000,000 francs.

POLAND.—A scheme drawn up by M. Joseph Lenartowicz, the chief engineer of the municipal tramways of Warsaw, for the construction of a system of underground and overhead electric railways in the Polish capital is at present under consideration by the Municipal Council of Warsaw. The projected lines would have a total length of 28¾ miles, of which 16¼ miles would be underground and 12½ miles overhead.

Great Western Railway.—AUTOMATIC TRAIN CONTROL.—The whole of the company's main lines between Paddington, Wolverhampton, Swansea and Plymouth has now been brought under the automatic train control system. The scheme has cost £250,000 to complete and has involved the equipment of 2,130 miles of track and 2,500 locomotives. Under the system the driver of a train is given audible warning of the state of the signals, and if a " distant " signal is passed at danger, the train is automatically stopped.

Huddersfield.—NEW TRAMCARS.—An inaugural run of the first of six new " English Electric " tramcars now being delivered was made recently, a number of members of the Tramways Committee, officials and guests being on board.

London.—NEW TROLLEY-'BUS SERVICE INAUGURATED.—A service of trolley-'buses was inaugurated on Wednesday, last week, by the London United Tramways between Wimbledon and Hampton Court, *via* Raynes Park, Malden and Kingston.

TUBE EXTENSIONS DELAYED.—The London Electric Railways, Ltd., has informed Deptford Borough Council that it is not practicable at present to consider the extension of the tube railway system to New Cross. The company states that the extension of the Bakerloo section from the Elephant and Castle to Camberwell Green involves an expenditure of about £1,600,000, which exhausts for the moment the entire resources of the Underground group of railways.

Manchester.—REGENERATIVE TRAMCAR EXPERIMENTS.—The Corporation Transport Department is carrying out experiments with regenerative tramcars on the Oldham route.

Southern Railway.—MAIN-LINE ELECTRIFICATION.—Good progress is reported on the Southern Railway's £2,250,000 scheme of main-line electrification and it is expected that the work will be sufficiently advanced to permit electric trains to be run as far as Reigate next summer. The complete electrification of the line to Brighton and West Worthing will be completed early in 1933.

Wakefield.—PROPOSED ABANDONMENT OF TRAMWAYS.—The Town Council has expressed itself in favour of the idea of substituting motor 'buses for the tramway system.

Telegraph and Telephone

Argentina Telephony.—The commercial secretary to His Majesty's Embassy at Buenos Aires reports to the Department of Overseas Trade that the Cia. Argentina de Telefonos proposes to construct a telephone line from Rafaela to Santiago del Estero, which will place the city of Tucuman in direct communication with Buenos Aires and the rest of the country. It is also proposed to initiate a service between Salta and Tucuman. It is estimated that these two lines will cost approximately $4,000,000, paper, of which $1,000,000 will be expended on the line from Rafaela to Santiago del Estero, $2,000,000 on an automatic exchange, and $600,000 on the line from Salta to Tucuman. It is reported that work on these systems will be commenced immediately.

China.—LONG-DISTANCE TELEPHONY.—Sir William Peel, the Governor of Hong-kong and the Provincial Governor of Canton, exchanged greetings over a new long-distance telephone line which was formally opened on September 1st, and photographs were telegraphically exchanged. The new connection, which is over a distance of 116 miles, is the first of its kind in China. It allows thirty conversations to take place simultaneously.

International Telephony. — TURKEY. — A public telephone service became available on September 3rd between Constantinople and Sofia.

ANGLO-ITALIAN SERVICE.—The Postmaster-General announces that, in order to meet the continued growth of telephone traffic between this country and Italy, a direct telephone circuit between London and Rome has been brought into service. There are now three direct circuits from this country to Italy, two to Milan, and one to Rome.

The Telephone Service.—ISLE OF MAN.—New rural automatic exchanges have been installed at Sulby and Marown. They are the first on the Island, and will each cater for twenty-five lines initially, the duplicate 50-volt 40-ampere-hour batteries being charged by a 1-h.p. petrol engine.

TWO MILLION MARK.—The total number of telephones operating in Great Britain on June 30th passed the 2,000,000 mark by 4,048, which represented a net increase of 9,201 on the total at the end of the previous month. Of that total, 720,425 were in London and 1,283,623 in the provinces, showing increases of 3,424 and 5,777, respectively. The total number of trunk calls in April, 1931, was 10,116,266, representing an increase of 209,506 on the total for the corresponding month of last year. Outgoing international calls in April numbered 45,155, and incoming international calls 48,673, as compared with 45,543 and 48,689, respectively, in April, 1930. Some 71 new overhead trunk circuits were completed during the month.

POLICE BOXES.—A warrant for the erection of twenty-four police boxes in Edinburgh has been granted at the Dean of Guild Court. They are the first instalment of a system to afford facilities to the public in cases of emergency and altogether 140 boxes will be erected. In each box there will be a loud-speaker telephone for communication with divisional headquarters.

Radio

Australia.—LICENCES.—During June an excess over cancellations of 2,351 licences for receiving sets was issued by the Postal department. In Victoria there was a falling off of 291, but that State still heads the list with a total of 137,265, as against New South Wales's 122,478. The proportion of licences to population in the Commonwealth is 5.12. In Victoria it is 7.66, and in West Australia only 2.17. Queensland receded during the month by 140; the other States had a surplus over cancellations. The aggregate of licences for the Commonwealth is 331,960.

France.—NEW STATION.—As the Marseilles (PTT) station, a wooden building in the courtyard of the Post Office, had already been scheduled for replacement, its destruction by fire on August 26th will hasten the erection of new plant about 13 miles north of Marseilles. It will have a power of from 25 to 30 kW, to be increased later to from 50 to 60 kW, and its cost will be between four and five million francs.

Licences.—COMPARATIVE STATISTICS.—The current issue of *World-Radio* contains interesting data relative to the number of receiving licences in force on December 31st, 1930. Of the total of 3,391,042, some 2,440,480 were in England, 595,507 in the London area, 210,369 in Scotland, 113,941 in Wales, and 30,745 in Northern Ireland. The leading counties were Lancashire (357,314) in England, Aberdeenshire (18,945) in Scotland (60,994) in Glasgow and 33,987 in Edinburgh), and Glamorganshire (68,982) in Wales. The total has since increased by 394,134, but distribution figures are not yet available.

Mexico.—NEW STATION.—A licence has been granted by the Government to a private citizen for the establishment of a big radio station at Villa Acuna, Coahulia, Mexico, across the border from Del Rio, Texas, says *World-Radio*. Its call letters will be XER and it will operate on a frequency of 665 kilocycles with a power of 75 kW. It will begin transmitting during the autumn.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—VICTORIA ELECTRICITY COMMISSION.—November 16th. Aluminium steel cored cable. (September 4th).

Beverley.—September 26th. East Riding and York Joint Board for Mentally Defectives. Electrical installation at Brandesburton Hall. (September 4th.)

Cranwell (LINCS).—September 17th. H.M. Office of Works. Electric wiring at the R.A.F. College. (August 28th.)

Derby.—October 5th. Tramway and Omnibus Department. Supply and erection of approximately 3½ miles of trolley-omnibus overhead lines. (See this issue.)

Dumbarton.—County Council. Three electrically driven centrifugal pumps and one oil engine-driven pump for Leven main-drainage scheme. Particulars from Mr. D. T. H. MacLennan, county engineer, 24, George Square, Glasgow.

Egypt (CAIRO).—October 8th. Prison Administration. Diesel engine driven generator for Abu Zaabal power station. (A.X. 11055.)*

October 28th. Department of Public Health. Electro-medical and X-ray apparatus for six months commencing November next. (A.X. 11069.)*

December 2nd. Ministry of the Interior. Complete power station for the town of Tantah. (A.X. 11066.)*

Fife.—September 15th. County Council. Electric lighting at Kirkcaldy West School. Schedules (deposit £1 1s.) from Mr. G. Sandilands, architect, Education Offices, Kirkcaldy.

Hull.—September 24th. Corporation electric lighting installations and fittings for schools at Ainthorpe Grove and Endyke Lane estate. Particulars (deposit £1 1s.) from Mr. D. Harvey, city architect, Hanover Square, Hull.

Lanarkshire.—September 15th. County Council. Various works, including the installation of electric lighting for 48 houses at Plains. Particulars from Mr. P. C. Smith, County housing and town-planning engineer, 13, Clydesdale Street, Hamilton.

London.—CENTRAL ELECTRICITY BOARD.—September 21st. Construction of site works, foundation works, &c., at Agecroft, Clarence Dock, Crewe, St. Helen's, Blackburn and Nelson. (August 14th.)

September 21st. Construction of site works, foundation works, &c., at Oxford, Gloucester, Bourne Valley, Swindon, Newport and Plymouth. (August 21st.)

LONDON COUNTY COUNCIL.—September 16th. Wiring and fittings for public staircases, &c., at Boundary Street estate, Shoreditch and Bethnal Green. (August 28th.)

September 14th. Wiring and fittings for electric lighting and bells at the Education Divisional Offices, Pentonville Road, N.1. (September 4th.)

September 21st. Wiring and fittings at St. James's Hospital, Balham. (August 28th.)

OFFICE OF WORKS.—September 15th. Electrical and mechanical engineering labour in Cardiff. (August 21st.)

METROPOLITAN WATER BOARD.—September 17th. Switchboard for two 200-kW and one 50-kW generators at Surbiton pumping station. (August 28th.)

FULHAM.—September 23rd. Borough Council. Wiring for lighting, heating, and cooking for Swan housing scheme. (September 4th.)

New Zealand.—WELLINGTON.—November 19th. New Zealand Railways. Intercall telephone system between Christchurch and Invercargill. (A. 11060.)*

Public Works Department. October 20th. Boosting transformers. (A.X. 11040.)*

December 15th. 270 galvanised steel transmission line towers, complete with arms, ground stubs and accessories. (G.X. 10703.)*

November 17th. Four 3,333-kVA oil-immersed, self-cooled transformers. (A.X. 11079)*

Oldham.—September 17th. Public Assistance Committee. Electric lamps required at the Institution, Rochdale Road. Specification from public assistance officer, Public Assistance Offices, Rochdale Road.

Plymouth.—September 14th. Electricity Department. E.h.p. metal-clad switchgear. (August 21st.)

Portsmouth.—September 19th. Electricity Department. Three l.p. sub-station switchboards. (September 4th.)

Rosslynlee.—September 26th. Midlothian and Peebles Asylum. Six months' supply of various articles, including electrical fittings. Forms of tender from Mr. Chilton L. Addison-Smith, clerk and treasurer, 19, Heriot Row, Edinburgh.

Salford.—September 16th. Electricity Department. Annual supply of 6,6000/400-V three-phase transformers. (September 4th.)

South Africa.—PRETORIA.—September 25th. Town Council. Sub-station switchgear. (A.X. 11075.)*

September 18th. Switchgear and auxiliary apparatus required in connection with the installation of one, or alternatively two, 12,500-kW sets. (A.X. 11037.)*

Sunderland.—September 14th. Corporation. Cable, wire, meters and lamps. (August 14th.)

Warrington.—September 21st. Electricity Department. Twelve months' supply of cables, earthenware conduits, concrete slabs and tiles. (September 4th.)

West Ham.—September 14th. Education Committee. Installation of electric lighting at South Hallsville Senior, Cheshunt Road and Pretoria Road Schools, now in course of erection. (August 14th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Dartford.—Housing Committee. Accepted:—
Wiring 105 houses on the Heath Estate (£515).—Bexley Heath Electrical Co.

Dewsbury.—Town Council. Accepted:—
L.p. switchgear (£400).—Yorkshire Switchgear & Engineering Co.

Fifeshire.—County Council Lunacy Committee. Accepted:—
Work in connection with the electricity supply for the Asylum, including transformer plant, etc. (£1,241.)—Moncrieff Bros.

Glasgow.—Finance Committee. Accepted:—
Installation of two electric lifts at St. Andrew's Hall (£1,160).—Waygood-Otis, Ltd.
Sewage Committee. Accepted:—
Installation of two water tube boilers in the Shieldhall (£3,650).—Babcock & Wilcox, Ltd.
Transport Committee. Accepted:—
Steel tubing.—Stewart & Lloyds, Ltd.; Scottish Tube Co., Ltd.
Armature coils.—Manchester Armature Repair Co., Ltd.
Time-recorders.—Gledhill Brook Time Recorders, Ltd.
Education Committee. Recommended:—
Electrical work at Kent Road School (£72).—Haddow & Co., Ltd.
Parks Committee. Recommended:—
Electric lighting and heating at Shettleston Pavilion (£115).—L. A. Fraser.

Hastings.—Electricity Committee. Accepted:—
Water softening plant for Broomgrove power station (£850).—Paterson Engineering Co., Ltd.

Lamp Contracts.—Siemens Electric Lamps & Supplies, Ltd., has received a repeat contract from the G.P.O. for a supply of electric lamps of various types, and has also received a repeat order from the Southern Railway for a supply of electric lamps for 12 months. The company has also received a further contract from the Admiralty for a supply of vacuum and gas-filled lamps.

Maidstone.—Town Council. Accepted:—
Switchgear (£6,722).—General Electric Co., Ltd.

Newcastle.—City Council. Accepted—
Installation of electricity in the Central Library (£380).—Simm & Richardson.
Extensions to the wireless installations at the City Hospital for Infectious Diseases (£93).—Robson & Coleman.

Newport.—G.W.R. Accepted:—
Five electric motors at Tunnel Yard.—Electric Construction Co., Ltd.

Wakefield.—Education Committee. Accepted:—
Electrical installation, Thornes House Secondary School.—L. E. Fowler.
Rewiring Lawefield Lane School.—W. Robb, Ltd.

Forthcoming Events

International Illumination Congress.—September 13th-18th, Cambridge. September 19th, London.

September 1st—September 25th. 9 p.m. to midnight each day. Illumination of principal London buildings.

Electrical Association for Women (Bradford and District Branch).—Tuesday, September 15th. Electricity offices, Sunbridge Road, Bradford. 7.30 p.m. "How Electric Cables are Made," by Col. A. P. Pyne. Monday, September 21st. Faraday Centenary lecture.

Institute of Metals.—September 13th-18th, Zurich. Autumn meeting.

National Radio Exhibition.—September 18th-26th. Olympia.

Royal Institution.—September 19th-25th. London. Faraday celebrations.

Institution of Electrical Engineers.—September 22nd-25th. Kingsway Hall, W.C. Summer meeting and Faraday celebrations. Royal Albert Hall. Conversazione and Faraday Exhibition.

(North-Western Students' Section).—Saturday, September 12th. 1.15 p.m. Visit to the works of Brookhirst Switchgear, Ltd., and Chester Electricity Department.

Institution of Mining Engineers.—September 23rd-25th. Manchester. Summer meeting.

British Association.—September 23rd-30th. Centenary meeting. September 23rd. Albert Hall, 3 p.m. Inaugural meeting. Central Hall, Westminster, 9 p.m. Presidential address by Gen. the Rt. Hon. J. C. Smuts.

Women's Engineering Society.—September 25th-28th. Crosby Hall, Cheyne Walk, S.W. Annual conference.

Association of Supervising Electrical Engineers.—Saturday, September 19th. Visit to Shipping, Engineering and Machinery Exhibition, Olympia. September 26th-27th. National conference, &c., with official visit to the Faraday Electrical Exhibition, Royal Albert Hall, London.

Electrical Power Engineers' Association.—September 26th. Holborn Restaurant, W.C. Annual dinner.

Iron and Steel Institute.—September 29th—October 1st. Swansea. Autumn meeting.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

Thermostatic metal ⅛in. thick.
BEATALL sign holders.

Notes

Fatality

An inquest was held on September 3rd at Macclesfield on Alexander Marcus John Lowe (47), who received a fatal electric shock whilst working in a transformer kiosk. It was stated that deceased entered the kiosk to sweep up rubbish, although he had been warned of the danger of doing so. A verdict of "Accidental death" was recorded, the jury adding a rider that instructions should be printed and circulated amongst the workmen.

Traffic Signals at Motherwell

On September 1st automatic electric traffic control signals were inaugaurated at Motherwell Cross. These form another link in a chain of automatic control of the town—the first link being forged some time ago by the erection of police boxes placed at convenient points in the burgh and fitted with automatic call signal lights, and the erection of automatic control signals at Wishaw Cross in June last. The traffic control signals are of the two-way type, which enable a vehicle driver to have two separate indications—one on the near side of his vehicle, and one on the diagonal corner ahead, in case of his view is being obstructed. Provost Anderson, J.P., closed the switch which set the signals to work. The signals are of the Holmes-Reyrolle type, and were erected by the Burgh Electricity Department.

The automatic control box embodies several features, and is adapted for hand control. The signals are purely police equipment, and as such a grant is made by the Ministry of Transport, both for the initial cost and for annual maintenance.

Floodlighting at Southend

Regarding the note which appeared in our last issue on the Southend illuminations, we are informed that the lighting strip holders used were "Bakelite" holders, made by "Beeantee" Illuminations, Ltd., the total supplied being 5,500.

X-rays in Industry

The report of a committee of the Department of Scientific and Industrial Research, which has been investigating, under the chairmanship of Sir Wm. Bragg, F.R.S., the application of X-rays to industrial research, was published on Tuesday.

The committee regards the method of X-ray analysis as having a very wide field of application. The method is essentially a physical one, but the problems belong to the applied fields of chemistry, metallurgy, mineralogy, biology, and other sciences, and the National Physical Laboratory should prove a particularly suitable centre for the work.

Although X-ray crystal analysis was first made in Great Britain, greater use has been made of it abroad, due probably to a lack of appreciation of its value. The suitability of a substance for its purpose often depends more upon the pattern of its crystals than upon chemical composition. Investigations have been made into the reasons for the loss of magnetism by tungsten steel when heated, and its subsequent recovery when further heated; these were found in the formation of chemical compounds.

Measuring Voltage Harmonics

With reference to the article bearing the above title which appeared in our issue of August 21st last (p. 280), we are informed by the A.E.G. Electric Co., Ltd., that the instrument there described is of its manufacture.

Annual Dinner of the Institute of Fuel

The annual dinner and dance of the Institute will be held at the Connaught Rooms, Great Queen Street, London, W.C.2, on Wednesday, October 21st, at which the president, Sir Hugo Hirst, Bt., will preside. The president and Lady Hirst will receive the members and guests at 6.45, and dinner will be served at 7.15 p.m. A large number of distinguished guests will be present, and the toast of "The Fuel Industries" will be proposed by the Rt. Hon. Sir Robert Horne, G.B.E., and responded to by the president.

The Testing of Flameproof Electrical Apparatus

The following is a copy of the contents of a letter from the Mines Department to the British Electrical and Allied Manufacturers' Association, Inc. It will probably clear many doubts that have arisen as to the position with regard to flameproof certificates issued by Sheffield University since the announcement of the new testing station at Buxton (ELECTRICAL REVIEW, July 31st, 1931, p. 168).

"A number of inquiries having been received as to the validity of Sheffield University certificates now that official certificates are being given by the Mines Department on the basis of official tests, it may be useful to give you the following explanation for communication to the members of your Association if you think desirable.

"The types of electrical apparatus tested formerly by Sheffield University and now by the Mines Department embrace (*a*) mining apparatus and (*b*) apparatus for other uses.

"With regard to mining apparatus, Sheffield University certificates are recognised and accepted by the Mines Department as *prima facie* evidence that the certified apparatus is flameproof.

"In the further matter of general safety design and construction, apparatus covered by a Sheffield certificate is usually such as the Mines Department would be prepared officially to approve and certify, but this will not necessarily be so in every instance. Knowledge has advanced and design has improved since testing work was started at Sheffield nine years ago—partly as a result of that work—and it will be necessary therefore for the Mines Department to review each case on its merits before an official certificate can be granted as the full equivalent of a Sheffield certificate. In many cases—and more particularly with Sheffield certificates of recent date—it will probably be possible for this to be done without further tests by examination of the apparatus or of specifications and drawings of it, and in that event the fee charged would be nominal.

"The same rulings apply and the same procedure will be followed with regard to apparatus for factories, petrol stores, &c., and the standard of requirements to be applied will, by arrangement with the Home Office and Board of Trade, usually be the same as for mining apparatus."

Regulations Regarding Electric Lines

The Electricity Commissioners have issued Regulations E.L.C. 12B, under Section Four of the Electric Lighting Act of 1888 (H.M. Stationery Office, 6d. net). These new Regulations supersede No. E.L.C. 12A of June, 1928, and differ from them with regard to additions made to Para. 28 and 41.

These paragraphs now read as follows, the new portions being indicated in italics:—

28. Where a line conductor crosses over or under, or is in proximity to, any other overhead wire precautions shall be taken by the owner to prevent contact, due to breakage or otherwise, between the line conductor and the other overhead wire, or between the other wire and the line conductor.

Provided that where a line conductor crosses over any overhead wire other than a telegraph or telephone line of the Postmaster-General, the precautionary means to be adopted shall be as hereinafter described in paragraph (3) *of Regulation* 41.

Provided *further* that this Regulation shall not be deemed to require the owner to take precautions against contact between a broken line conductor and other auxiliary conductors and earth wires carried on the same support and forming part of the same overhead line.

41. (3) *In the case of a line crossing over any other overhead wire there shall be provided—*

(*a*) *duplicate insulators for supporting the line conductor and a device to ensure that in the event of a line conductor falling it shall be put to earth; or*

(*b*) *duplicate insulators supporting duplicate conductors tied at intervals not exceeding five feet;*

the provision prescribed in (*a*) *or* (*b*) *hereof being supplemented in the case of line conductors at voltages exceeding* 650 *volts by the provision of arcing horns or rings; or*

(*c*) *other means approved by the Electricity Commissioners.*

Appointments Vacant

Mains foremen for Manchester Electricity Department.

Tramway and transport general manager for Leeds Corporation.

(See our advertisement pages to-day.)

Educational

UNIVERSITY COLLEGE, LONDON.—The Faculty of Engineering syllabus for the 1931-32 session is now available and gives detailed particulars of the various courses, scholarships, &c. Copies may be obtained on application to the Secretary.

SCHOOL OF ENGINEERING & NAVIGATING, Poplar, E.14.—Courses in electrical engineering and electrical installation work will commence on September 28th. Enrolment takes place during the week commencing September 21st. (See our advertisement pages to-day.)

REGENT STREET POLYTECHNIC, W.1.—Courses in electrical engineering, telephony, telegraphy, radio and high-frequency engineering will commence on September 28th. (See our advertisement pages to-day.)

WILLESDEN POLYTECHNIC, Priory Park Road, Kilburn, N.W.—The 1931-32 syllabus is now available, and the new term will start on September 28th. An exhibition of students' work will be held at the Polytechnic from September 21st to 28th.

BRIGHTON TECHNICAL COLLEGE, BRIGHTON.—We have just received a copy of the calendar for 1931-32, giving particulars of the various courses for the coming session, together with a list of the principal successes during the past year.

NORTHAMPTON POLYTECHNIC INSTITUTE, St. John Street, London, E.C.1.—Particulars of the classes in electrical and radio engineering are now available for the 1931-32 session. Classes will commence on September 21st, enrolments being taken during the week commencing September 14th. Full details may be obtained from the Principal, Mr. S. C. Laws.

The Lighting of Churches

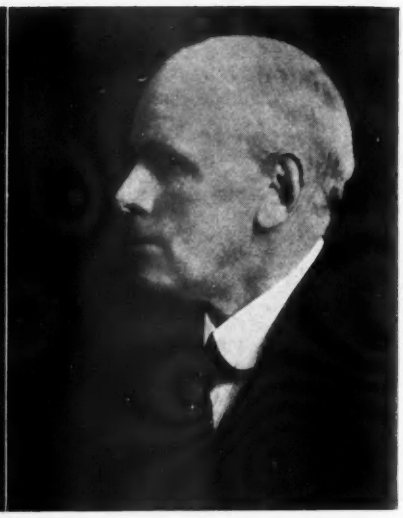
Owing to the rapid spread of electric power in Leicestershire many church authorities in the diocese are converting their systems of lighting to electricity, according to *The Times*. The Bishop of Leicester's Advisory Committee observes that the cheaper forms of casing for wire should be avoided. It is especially harmful to bring "lead" into contact with oak and also certain kinds of stone. Screwed steel tubing for the enclosure of wiring seems to be the most highly recommended. The introduction of large globes, covering powerful lamps, into churches is much criticised and had better be avoided. The use of overhead wires in churchyards will not be approved by the Chancellor except in very special circumstances.

Our Personal Column

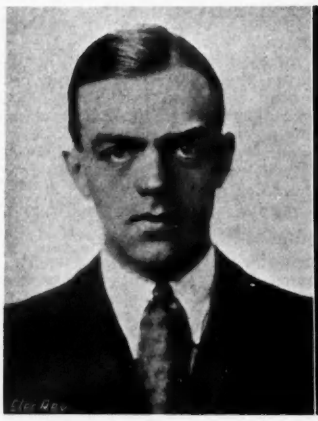
Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Sir P. Cunliffe-Lister, President of Board of Trade (*Photograph by Elliot and Fry, Ltd.*)

Mr. P. J. Pybus, Minister of Transport (*Photograph by International Photogravure Service, Ltd.*)



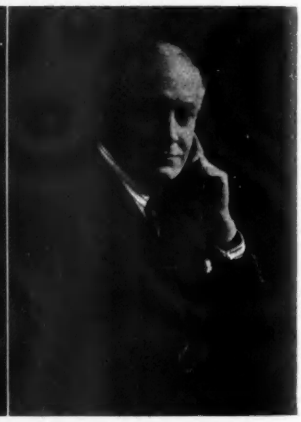
Mr. G. M. Gillett, Parliamentary Secretary to the Minister of Transport (*Photograph by Elliott and Fry, Ltd.*)



Major G. Lloyd George, Parliamentary Secretary to the Board of Trade (*Photograph by Press Portrait Bureau*)

Major W. Ormsby-Gore, Postmaster-General (*Photograph by Lafayette, Ltd.*)

Mr. Isaac Foot, Secretary for Mines (*Photograph by Press Portrait Bureau*)



Lt.-Com. Sir Edward Hilton-Young, Secretary, Department of Overseas Trade (*Photograph by Lafayette, Ltd.*)

Men in the New National Ministry who will look after Electrical Matters

In the above selected group of gentlemen in the new National Ministry who will be responsible for electrical matters, the one most directly known to the profession and industry is **Mr. P. J. Pybus,** who succeeds Mr. Herbert Morrison as Minister of Transport. The chief subjects which concerned Mr. Morrison during his period of office were the work of the Electricity Commissioners and latterly the Transport Bill and the electrification of railways. Mr. Pybus is well known by reason of his connection with the English Electric Co., Ltd., of which both he and Sir E. Hilton Young, the new Secretary for the Department of Overseas Trade, are directors.

Mr. E. Harper, M.I.E.E., who has held the position of chief engineer to the Post and Telegraph Department, Ceylon, for the past ten years, is shortly relinquishing this appointment and returning to England.

Among recent acceptances of membership of the Scottish National Development Council are **Sir Andrew R. Duncan,** chairman of the Central Electricity Board, and **Mr. Joseph Taylor,** representing the Institution of Electrical Engineers (Scottish Centre).

The wedding took place at the Abbey, Erdington, Birmingham, on Friday of **Mr. George Rogers,** of the technical staff of the Birmingham Electricity Department, and **Miss Dorothy Lowry,** a member of the clerical department at the offices, Dale End. Many electrical engineers were present.

Mr. W. Redman, electrical engineer to the Shipley Urban District Council, who is retiring, was on September 1st presented with an inscribed gold wrist watch, the gift of the departmental employés.

Mr. S. Evans, sales manager, S. G. Leach & Co., Ltd., who has vacated that position, notifies us that his address is Havenfield Cottage, Great Missenden, Bucks.

A complimentary banquet is to be given by old Cromptonians to **Col. R. E. Crompton,** C.B., R.E., the Faraday Medallist of 1922, during the Faraday Centenary Celebrations on Thursday, September 24th, at the Savoy Hotel. Among those who have accepted invitations are the following distinguished foreign scientists:—Dr. Elihu Thomson; Dr. Enström (president, International Electrotechnical Commission); Prof. Feldman (Holland); Sig. Lombardi (Italy); M. Brylinski (France).

The Times reports that **Senator G. Marconi** has been chosen by Signor Mussolini to represent Italy at the coming Faraday Centenary celebrations.

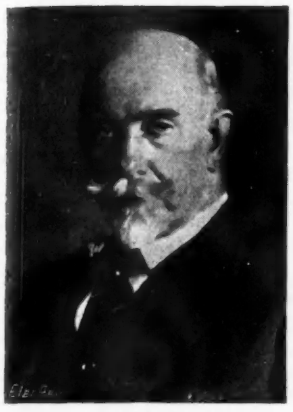
Mr. J. B. Collinge, superintendent of the Salford Corporation power stations, is, according to a Manchester paper, to retire at the end of the current month after 30 years' service.

Miss L. Bearder, of Worcester, has been appointed lady demonstrator at the Eccles Corporation electricity showrooms for a probationary period of twelve months at a salary of £170 per annum.

Mr. C. H. Lackey, of the Technical Research Department of Messrs. A. Reyrolle and Co., Ltd., has been awarded the Silvanus Thompson Scholarship for 1931 by the Institution of Electrical Engineers.

Mr. C. W. Salt, electrical engineer to Carlisle Corporation, has been elected vice-chairman of the Northern Counties Area Committee of the British Electrical Development Association.

In our Business and Industrial Notes will be found a brief report of the Jubilee celebrations of Messrs. Mavor and Coulson, Ltd., which were held on Friday last at Glasgow. The occasion was chosen for the presentation by the employés to **Mr. Sam Mavor** (chairman and managing director) of a portrait of himself in oils, painted by Mr. J. B. Anderson. Mr. Mavor was closely associated with his brother, the late Mr. Henry A. Mavor, founder of the company, who pioneered electrical engineering in Scotland, and, among other works, established at Glasgow the first power station for the public supply of electricity in Scotland. He was also a pioneer in the application of electricity for use in mines, and developed coal-cutting machines and underground conveyors. He was responsible for the introduction of machine mining on an extensive scale on the Continent and in various other parts of the world. He is the author of a number of papers on electrical machine mining and geographical subjects. **Mr. W. A. Coulson,** a director, who has been connected with the company for over 40 years, was presented with a dinner service of Royal Doulton ware.



Mr. Sam Mavor
From a painting by J. B. Anderson

Mr. James McKinnon Mowat, B.Sc., who was married on September 2nd to Miss Jessie C. F. Ross Anderson, elder daughter of Provost Anderson, J.P., of Thornlea Park, Wishaw, was presented by the staff of Anderson, Boyes and Co., Ltd., of the Flemington Electrical Works, Motherwell, with a silver salver, by the works department with a clock, and by the foundry employés with a brass horse-shoe mounted in an oak case.

Sir William R. Morris, the motor-car manufacturer, has given £25,000 to the British Empire Cancer Campaign for the establishment of a research fellowship in radiology at the Mount Vernon Hospital, near Northwood, Middlesex.

Obituary

Herr E. O. Zwietusch.—The death is reported from Berlin, as the result of a motor accident, of Herr E. O. Zwietusch, the chief engineer of the Lorenz telephone and electrical instrument concern of Berlin. The deceased was born in the United States of German parents in 1866, but after being with the Western Electric Co. in Chicago for some years, settled down in Germany in 1888 and became one of the leading authorities on telephones in that country.

Col. J. Lynn Marr.—The death is recorded at his home at Sunderland of Colonel J. Lynn Marr, a director of the Electrical General Stores Company, Newcastle-upon-Tyne.

Will.—The late **Mr. Reginald Charles Clinker,** chief research engineer for the British Thomson-Houston Co., Ltd., left £11,414 (£9,837 net personalty).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Oxford Broadcasting Relay, Ltd.—Private company. Registered September 1st. Capital £3,000 in 2,500 8 per cent. cumulative preference shares of £1 and 10,000 ordinary shares of 1s. each. Objects: To adopt agreements (i) with the Corporation of Oxford, and (ii) with Standard Radio Relay Services, Ltd., and to establish a service for relaying radio programmes in Oxford and neighbourhood. The subscribers are: W. D. Cavendish, 25, Radcliffe Square, S.W., and F. J. A. Walsh, Thanet, Boar's Hill, Oxford. The first directors are to be appointed by the subscribers.

Northern Wireless Relay Co., Ltd.—Private company. Registered September 3rd. Capital £10,000 in 9,000 8 per cent. cumulative preference shares of £1 and 20,000 ordinary shares of 1s. each. Objects: To establish, maintain and develop a service for the relaying of radio programmes in Newcastle-on-Tyne and neighbourhood, &c., and to adopt an agreement with Standard Radio Relay Services, Ltd. The subscribers are: G. C. Robinson, 26, North Avenue, Gosforth, Newcastle-on-Tyne, and Christina I. Scott, 130, Dilston Road, Newcastle-on-Tyne. G. C. Robinson is managing director. Registered office: 22, Grove Street, Newcastle-on-Tyne.

Economic Dryer Co., Ltd.—Private company. Registered September 2nd. Capital £2,000 in £1 shares. Objects: To acquire the business carried on by H. E. S. Baylis and J. Corfield, as the "Economic Dryer Co.," and to carry on the business of manufacturers of and dealers in drying cabinets, heating and drying appliances of all kinds and domestic appliances, either mechanical, electrical or gas, &c. The directors are: J. Corfield, Pincroft Wood, Longfield, Kent (director, British Domolac Co., Ltd.); and H. E. S. Baylis, Ingleglen, Farnham Common, Bucks. Registered office: 170, Chandos House, Buckingham Gate, S.W.1.

Dixon Bros. & Wood, Ltd.—Private company. Registered September 2nd. Capital £1,000 in £1 shares. Objects: To acquire the business of manufacturers, hitherto carried on at 92, Harrow Road, Leytonstone, E.11, by Dixon Bros., and to carry on the business of engineering, electrical or wireless dealers, &c. The directors are: H. A. W. Wood, 84, Galpins Road, Thornton Heath; C. L. Dixon, 73, Cavendish Drive, Leytonstone, E.11; and R. H. Dixon, 86, North Birkbeck Road, Leytonstone, E.11.

Metalion, Ltd.—Private company. Registered September 3rd. Capital £2,100 in 2,000 10 per cent. participating preference shares of £1 and 2,000 ordinary shares of 1s. each. Objects: To acquire and exploit the exclusive rights for the British Empire in the invention of R. J. Fletcher, relating to a secret process of the electro-deposition and cleaning of metals, &c. The permanent directors are: A. E. Tolley (address not stated), and A. W. Hajdukska, 8, King William Street, E.C.4.

"Speakeasie" Home Recorders, Ltd.—Private company Registered September 2nd. Capital £10,000 in £1 shares. Objects: To acquire the right to manufacture, use, exercise, and vend home recording machines, acoustical and electrical, throughout the world under the name of "Speakeasie" home recording machines, and the benefit of any registered application for the use of the word "Speakeasie" as a trade mark, and to adopt an agreement with C. N. M. Ramsay. The first directors are: G. E. Millner, "Rallywood," Ockley, Surrey; and E. W. Hobson, Allerford House, Allerford, Somerset. Secretary: C. A. Gardiner. Registered office: 24, Berners Street.

T. A. Beavon & Co., Ltd.—Private company. Registered September 1st. Capital, £1,500 in £1 shares. Objects: To carry on the business of electricians, mechanical engineers, and contractors, manufacturers of and dealers in wireless telephones and telegraphic apparatus, parts and accessories, etc. The first directors are: T. A. Beavon, Radio House, Chester Road, Wrexham, radio factor (managing director), and S. F. Hathaway, Radio House, 287, Edge Lane, Liverpool, radio factor (both permanent). Registered office: Radio House, Chester Road, Wrexham.

Roth Equipments (Great Britain), Ltd.—Private company. Registered September 4th. Capital £5,300 in 5,000 8 per cent. cumulative participating preference shares of £1 and 6,000 ordinary shares of 1s. each. Objects: To carry on the business of electrical and mechanical engineers, manufacturers of, agents for, and dealers in scientific instruments, &c. The subscribers are: L. R. Fergusson, 47, Hamilton Road, Thornton Heath; and E. R. Milner, 10, Kensington Gardens Square, W.2. The first directors are not named.

Condenser Electric Co., Ltd.—Private company. Registered September 4th. Capital £2,800 in £1 shares (600 6 per cent. cumulative preference and 2,200 ordinary). Objects: To acquire the business of a manufacturer of electrical condensers, carried on by R. E. Miles, of Broadway House, South Street, Romford, as "The Condenser and Electric Co." The directors are: R. E. Miles, St. Edmundsbury, The Avenue, Romford; N. Blades, Allerton, Woodlands House, Hornchurch, Essex; and Winifred R. Miles (address not stated). The two first-named shall be permanent governing directors so long as they each hold £100 shares.

J. Fabian, Ltd.—Private company. Registered August 29th. Capital £1,000 in £1 shares. Objects: To make, buy and sell electrical equipment, motor and cycle accessories, wireless sets and component parts, &c. The subscribers are: J. Fabian and Mrs. E. Fabian, both of 52, Crest Road, Cricklewood, N.W.2. J. Fabian is the first director. Registered office: 25, Cowper Street, E.C.2.

R. Roberts (Birmingham), Ltd.—Private company. Registered August 28th. Capital £500 in £1 shares. Objects: To carry on the business of wholesale and retail manufacturers and factors of apparatus, components and instruments for the transmission and reception of wireless telephony and telegraphy, gramophones and gramophone records, cycles and accessories, electrical engineers, engravers, &c. The directors are: R. Roberts, "Croydon," Cremorne Road, Four Oaks, Warwickshire; and H. R. Sewell, 213, Holly Road, Handsworth, Birmingham, C.A. Secretary: H. R. Sewell. Registered office: 52, Newton Street, Birmingham.

United Radio Manufacturers.—Private company. Registered September 3rd. Capital £100 in £1 shares. Objects: To carry on the business of manufacturers and distributors of and dealers in mechanical, electrical and radio apparatus, &c. The directors are: C. O. Stanley, Lesselane, Clonakilty, County Cork; and Ursula H. Stanley, Ellerhow, The Greenway, Gerrard's Cross.

Automobile Electrics, Ltd.—Private company. Registered September 2nd. Capital £500 in £1 shares. Objects: To carry on the business of electrical and motor engineers and agents, manufacturers of and dealers in motor vehicles, wireless apparatus, electrical and other equipment, transport contractors, &c. The first directors are: W. F. Cooper, 121, Great Colmore Street, Edgbaston, Birmingham; and E. R. Shelley, Fernley, Hardwick Road, Streetley, Staffs.

Philco Radio and Television Corporation of Great Britain, Ltd.—Private company. Registered September 7th. Capital, £20,000 in £1 shares. Objects: To acquire and use the registered trade mark "Philco," and to carry on the business of manufacturers, constructors and repairers of and dealers in radio, radio parts, records, storage batteries, telephone, telegraphic and television apparatus, &c. The subscribers are: M. O. Marshall, 12, Ashburn Place, S.W.7, and T. E. Baldwin, 113, Nightingale Road, Carshalton, Surrey. The directors are: J. M. Skinner, C. L. Dyer, H. W. McAteer, J. S. Thomas, and E. S. Peyton, addresses not stated. Secretary (pro tem): T. E. Baldwin. Registered office: 380, Gresham House, Old Broad Street, E.C.2.

Returns of Electrical Companies

Electrodrives, Ltd.—D. R. Evans, of 29-30, King Street, Cheapside, E.C.2, ceased to act as receiver and manager on August 25th.

Rose & Partridge, Ltd.—Debenture, dated August 26th, to secure £1,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: A. H. Rose, 5-7, Finsbury Court, E.C.2.

British Battery Co., Ltd.—Debenture, dated August 21st, 1931, to secure £300, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: J. W. H. Reynolds, 20, Kingsbridge Avenue, Ealing, W.

Falconar Cross & Co., Ltd.—Mortgage dated August 22nd, to secure £4,150, and any other sums to become due, charged on 7 and 9, Ridley Place, Newcastle-upon-Tyne. Holders: Percy Building Society, Market Street, Newcastle-upon-Tyne.

Burgess Hill and District Electric Supply Co., Ltd.—Capital £16,000 in £1 shares (6,000 ordinary, 4,000 "A" preference, 3,000 "B" preference, and 3,000 preference). Return dated April 14th, 1931: 5,250 ordinary, 3,000 preference, and 4,000 "A" preference shares taken up; £10,400 paid; £1,850 considered as paid. Mortgages and charges, £3,000.

Cambridge Electric Supply Co., Ltd.—Capital £400,000 in £1 shares. Return, dated April 22nd, 1931: All shares taken up; £400,000 paid. Mortgages and charges, £30,000.

Urban Electric Supply Co., Ltd.—Satisfaction in full on July 8th, 1931: (i) of trust deed dated July 28th, 1904, and registered August 17th, 1904, securing debenture stock; (ii) of disposition dated July 28th, 1904 (supplemental to trust deed of same date), and registered August 17th, 1904; and (iii) of deed dated December 17th, 1906, acknowledgment of indebtedness £75,000 debenture stock dated April 27th, 1907, conveyance dated May 30th, 1907, two acknowledgments of indebtedness dated January 4th, 1911, and January 31st, 1914, and sub-demise dated September 16th, 1915 (supplemental to trust deed dated July 28th, 1904), and registered December 31st, 1906, May 10th, 1907, June 12th, 1907, January 20th, 1911, February 20th, 1914, and September 24th, 1915, respectively. (According to the register of mortgages, the trust deed registered August 17th, 1904, originally secured £200,000 debenture stock.)

Harris, Williams (Servis), Ltd. (formerly Harris, Williams (Manufacturers), Ltd.).—D. Morris, of 22, Charterhouse Square, E.C., was appointed receiver and manager on August 26th, under powers contained in debentures, dated August 13th, 1930, and November 8th, 1930.

West Wales Electric, Ltd.—Capital £500 in £1 shares. Return dated October 14th, 1930 (filed April 17th, 1931). 450 shares taken up. £450 paid. Mortgages and charges, nil.

Looe Electricity Co., Ltd.—Capital £8,000 in £1 shares. Return dated April 13th, 1931. 5,900 shares taken up. £5,900 paid. Mortgages and charges, nil.

Great Western Ignition Co., Ltd.—Capital £2,000 in £1 shares. Return dated March 31st, 1931. 950 shares taken up. £950 paid. Mortgages and charges, none.

Upfields Wireless, Ltd.—Capital £300 in £1 shares. Return dated March 30th, 1931. All shares taken up. £300 paid. Mortgages and charges, £1,000.

W. Skewes & Co., Ltd.—Capital £1,000 in £1 shares. Return dated May 6th, 1931. All shares taken up. £650 paid. £350 considered as paid. Mortgages and charges, nil.

City Notes

Companies to be Struck Off the Register

The names of the undermentioned companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary:—

British Electrical Trust, Ltd.
The Farnham Royal Accumulator Co., Ltd.
Glittering Signs, Ltd.

The British Aluminium Co., Ltd., has decided to await the full year's trading results before consideration of the payment of a dividend on the ordinary share capital. A dividend of 3 per cent. for the six months ended June 30th last is announced on the preference shares.

Belgian Company.—The Brussels correspondent of the "Financial News" reports that the directors of the "Societe Internationale d'Energie Hydro-Electrique" (Sidro) have decided to pay the statutory dividend of 15 fr. A sum of 43,600,000 fr. has been provided for the payments, and it is also proposed to take 1,500,000 fr. to legal reserve, making that fund 25,000,000 fr., equal to 10 per cent. of the capital.

The Direct Spanish Telegraph Co., Ltd., has declared the usual dividend on the preference shares for the half year to June 30th at the rate of 10 per cent. per annum, less tax. Owing to the decline in traffic receipts the company is unable to pay an interim dividend on the ordinary shares.

Stewarts & Lloyds, Ltd., have announced an interim dividend of 3 per cent. on the preference shares, and 5 per cent. on the preferred ordinary shares.

The Globe Telegraph & Trust Co., Ltd., has announced that the income is insufficient to pay any interim dividend on the ordinary shares for the first quarter of its financial year. For the corresponding period of the year 1930-31 an interim dividend of 5s. per share, tax free, was paid, and a similar payment was made in the following quarter. For the last two quarters, however, the distributions were reduced to 3s. 6d., making 8½ per cent. for the year, as compared with 10 per cent., tax free, for many years previously.

The Para Electric Railways & Lighting Co. has notified debenture holders that, owing to the fall in the Brazilian exchange, the company's cash resources, when converted into sterling, are not likely for some time to be sufficient to pay the half-year's interest on the 5 per cent. first debenture stock. Meetings of debenture stockholders and preference shareholders are to be held, therefore, on September 28th, to approve the granting of a three-years' moratorium in consideration of an increase in the rate of interest from 5 to 6 per cent. per annum, as from December 1st next.

Davis & Timmins, Ltd., have decided to defer for the present the consideration of payment of the usual half-yearly dividend on the 6½ per cent. preference shares.

Ward & Goldstone, Ltd., have announced the usual interim dividend for the half-year on the cumulative preference shares at the rate of 7 per cent. per annum.

The Hendon Electric Supply Co., Ltd., has announced an interim dividend of 10.85d. per share, tax free, on the ordinary shares (same).

The Electric Supply Corporation, Ltd., announces an interim dividend of 4 per cent. on the ordinary shares.

Stocks and Shares

TUESDAY EVENING.

THE new Government, which meets Parliament to-day, has as its first task the presentation of a financial statement which will call for an equality of sacrifice the extent of which has evoked dozens of rumours, but no definite details. It is taken for granted, however, that taxation will be considerably increased, and the prices of gilt-edged stocks remain under the fear of what possibilities may materialise into fact in the immediate future. British Government securities, and most of the other investments which carry a fixed rate of interest, have been depressed, although a rally occurred from the lowest prices touched about a week ago. In the markets connected with electricity no outstanding features of consequence have occurred, the various sections marking time in advance of Mr. Philip Snowden's speech on Thursday in this week. Home Railway stocks are heavy. Amongst Ordinary shares, no recovery has occurred in those of the manufacturing and equipment companies.

Underground Prior-Charge Stocks

Central Electricity 4½ per cent. stock has come down a point to 95½, and the 5 per cent. stock to 100. Business in the former was done last week at 93½, and the 5 per cent. stock has been changing hands below par. The Board's 4 per cent. stock is quoted at 84. London and Home Counties 4½ per cent. debenture at 96 shows a fall of ½. Metropolitan District 6 per cent. debenture stock has gone back to 118. London Electric 5 per cent. redeemable debenture, 1985-95, is on offer at 102, to yield £4 18s. per cent., and Underground Electric Railways 5 per cent. first mortgage debenture, 1942-63, can be bought in a small way at 99, to give £5 2s. per cent. on the money. Interest on the last-named is due on the 15th May and November. It was announced before the meeting of Parliament that the London Traffic Bill is included amongst measures which are to be passed in the new session.

London's Tubes

Underground Electric Ordinary shares have recovered to 19s. 6d., being amongst the few prices in our list this week to show an improvement. The London Electric Railways Company, declining a request from the Deptford Borough Council to carry the tube system to New Cross, points out that the extension of the Bakerloo section to Camberwell Green, now being undertaken, involves an outlay of £1,600,000, and that this exhausts the resources of the Underground group at the moment. The Company adds that under the London Passenger Transport Bill the whole of the tube undertakings are to be transferred to a board, and it will not be possible for extensions to be undertaken that involve any increase of capital commitments until the new board is in operation and its financial position ascertained. The three ordinary stocks of the Central London, City & South London, and London Electric Companies, have been put down two points apiece. They now stand at the common level of 59½. Metropolitan Ordinary has given way to 35½.

Electricity Supply Shares

Falls in County of London of 1s. 9d. to 43s. 3d., and 1s. in Metropolitans to 39s. 6d., have brought the yields on the shares to a trifle over 5 per cent. on the money. There has been a mild speculative account in both for some time past, speculative in the sense that people bought the shares with the intention rather of selling them at a profit than holding them for permanent investment. With the money market in its present state, and the War Loan paying a shade over 5 per cent. on the money, ordinary shares that give a return of less than 5 per cent. are not in request at present.

Westminster Ordinary at 29s. are a shade lower. Amongst provincial shares, Bournemouth & Poole eased off to 57s. 6d., and Scottish Power shares are 1/16 down at 26s. 3d. Electric Distribution of Yorkshire new shares keep steady at 6s. 6d. premium. A call of 5s. per share was due on Monday in this week, and made the shares 21s. paid, leaving another 5s. to bring up the total to the 26s. at which the shares were offered to the proprietors. The old ordinary shares keep their price at 32s. 6d. Northamptons at 38s. 6d., and Richmond (Surrey) at 39s. 6d., continue to be firmly held. The South Wales Power Company is to hold a meeting on September 18th in order to wind up the Company voluntarily, as the assets have now been sold. These latter consisted of practically all the capital, and £876,000 prior lien debenture stock of the South Wales Electric Power Distribution Company, both of which were sold to the Three Counties Electric Power Company for a little over 1¼ million pounds.

Calcutta Companies

Calcutta Electric Supply shares have been dull for some time past, on account of the political disturbances in India, but in its recent announcement regarding extension of its operations, the company makes no mention of any unfavourable development arising out of the Indian situation. The Company has been at work since December, 1929, upon a tunnel under the Hooghly River, which became necessary in order to supply the demand for electrical energy on the right-hand bank of the river. This tunnel has reached, during the past few days, the shaft on the bank from which electricity will be provided to areas that the Company is on the point of serving. Calcutta Tramway shares, it may be added, have become a somewhat nominal market on the basis of 6s., the 5 per cent. preference shares being quoted at 10s., and the 4½ per cent. debenture stock at 63½.

Cables and Wireless

After being acutely flat, the price of Cables & Wireless 5½ per cent. preference rallied to its previous figure of 47½. The ordinary stock remains at 13, and the "B" ordinary at 7. Anglo-American Telegraph preferred at 102½ is ½ lower, Globe ordinary fell 10s. to 5½, and the preference, 5s. to 7½, on the announcement that the Company's income is insufficient to pay any interim dividend on the ordinary shares in respect of the first quarter of the current year. This time last year the shares received 5s. The dividend for the whole of 1930-31 was made up to 8½ per cent., comparing with 10 per cent. paid in each of the previous ten years. American Telephone and Telegraph at 170 is down 10 points, and International Telephones at 26 show a fall of 3. Great Northerns are 10s. lower at 23½. Shares changed hands at the end of last week down to 23. The Direct Spanish Telegraph Company has announced its inability to pay an interim dividend on the ordinary shares. The 10 per cent. preference shares will receive their usual half-yearly dividend on the first of next month. Atlas ordinary have recovered to 14s. 6d.

South American Troubles

Chile having defaulted on its interest, and Brazil having declared a temporary suspension of sinking fund payments, it can hardly be supposed that South American issues would be particularly bright. Rio Tramway 5 per cent. first bonds rose a point at 97½, but the 5 per cent. second mortgage bonds went back 2, at 82½. Anglo-Argentine Tramways show no further losses. The 5 per cent. preference shares changed hands at the end of last month, and on the same day, at 5s. and at 7s. 9d. Brazilian Tractions are quoted at 16. Meetings of holders of shares and debenture stocks of the Para Electric Railways & Lighting Company are to be held on the 28th of this month to consider resolutions for increasing the rate of interest on the debentures from 5 per cent. to 6 per cent. per annum, in consideration of their granting a three-years' moratorium, and forgoing the special rights appertaining to the original preference shares. The Company cannot meet its half-year's interest on the debenture stock owing to the fall in Brazilian exchange. The price of the ordinary shares is quoted at 1s., and the last business done in them is officially marked at 6d. and 7d. on December 18th, 1930. The 6 per cent. preference changed hands a few days ago at 1s. 1½d., and the 5 per cent. first debenture stock has fallen to 21½.

Manufacturing Issues

Telegraph Constructions have been marked up to 10 in the Stock Exchange Official List, as against the previous price of 9½, but business has been done recently at 9. British Insulated at 2½, are ⅛ down. General Electric ordinary weakened to 39s. 6d., and the preferences are both easier. Associated Electric Industries ordinary went back to 19s. 6d. British Aluminium ordinary at 25s. regained the small loss which they sustained last week. English Electric ordinary were done a few days ago at 4s. 6d., and the preference at 4s. Among miscellaneous matters, it may be mentioned that Barcelona Traction Light & Power shares have fallen to 11½ on news of a general strike at Barcelona. Canadian utility issues have been passed over, so far, in the weakness which attacked the railway stocks of all the principal Canadian railways. Babcock & Wilcox shares remain at £2 2s., and Vickers are 6s. 9d. The rubber share market shows a better tendency in consequence of a small rise in the price of the raw produce.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1929.	1930.	Price, Sept. 8, 1931.	Rise or Fall.	Yield p.c.
HOME ELECTRICITY COMPANIES						
Bournemouth and Poole	£1	15	15	57/6	—⅛	5 4 2
Brompton Ordinary	£1	8½	8½	28/6	—	4 18 3
Central Electricity 4½% Deb.	Stock	—	4½	95½	—1	4 14 3
Charing Cross Ordinary	£1	8½	8½	30/6	—	4 11 10
Chelsea	£1	8⅞	8⅞	28/–	—	5 0 0
City of London	£1	10	10	37/–	—	5 8 1
Clyde Valley	£1	8	8	30/–	—9d.	5 6 8
County of London	£1	11	11	43/3	—1/9	5 1 10
Edmundsons' 7% Pref.	£1	7	7	26/–	—	5 7 8
Elec. Supply Corporation	£1	11	11	42/6	—	5 3 6
Kensington Ordinary	£1	8	8	29/6	—	4 15 0
Lancs. Light and Power	£1	7	6½	21/3	—	6 2 4
London & Home Counties 4½% Deb.	Stock	—	—	96	—½	4 13 9
London Electric	£1	8½	9	33/6	—	5 7 6
Metropolitan	£1	9	10	39/6	—1/–	5 1 3
Midland Counties	£1	6½	7	27/–	—	5 3 8
Mid. Elec. Power	£1	15	8	28/3	—	5 13 3
Newcastle-on-Tyne Ordinary	£1	6	6	21/3	—	5 13 0
Do. 7% Pref.	£1	7	7	27/6	—	5 1 10
Notting Hill 6% Pref.	£10	6	6	11½	—	5 6 8
North Met. Elec. 6% Pref.	£1	6	6	24/–	—	5 0 0
St. James' and Pall Mall	£1	8	8	29/6	—	4 15 0
Scottish Power	£1	8	8	26/3	—1/16	6 2 0
South London	£1	8½	8½	27/6	—	5 1 10
Urban Ordinary	£1	7	7	28/3	—	4 19 1
Westminster Ordinary	£1	8½	8½	29/–	—6d.	4 16 7
Whitehall Elec. Invst. 7½% Pref.	£1	7½	7½	24/9	—3d.	6 0 9
Yorkshire Elec.	£1	8	8	30/–	—	5 6 8
HOME RAILS						
Central London Ord. Assented	Stock	4	4	75	—	5 6 8
Metropolitan	,,	4	3½	35½	—1	9 17 2
Do. District'	,,	5	—	59½	—	8 8 0
Underground Electric	£1	8	8	15/6	+6d.	8 4 2
TELEGRAPHS AND TELEPHONES						
Anglo-Am. Tel. Pref.	Stock	6	6	102½	—½	5 17 1
Do. Def.	,,	1½	1½	25	—	6 0 0
Cables & Wireless 5½% Pref.	Stock	5½	5½	47½	—	—
Do. A 7½% Ord.	,,	Nil	—	13	—	—
Do. B Ord.	,,	Nil	—	7	—	—
Globe Tel. and T. Ord.	£10	10	8½	5½	—½	—
Do. do. Pref.	£10	6	6	7½	—¼	8 5 6
Great Northern Tel.	£10	20	20	23½	—½	8 10 2
Marconi-Marine	£1	15	15	30/–	—	10 0 0
Oriental Telephone Ord.	£1	12	12	2¼	—	*5 12 11
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	£5	5½	—	7/6	—	—
Do. do. 2nd Pref.	£5	6	—	6/3	—	—
Do. do. 5% Deb.	Stock	5	5	18	—	—
British Electric Traction Def. Ord.	,,	5	5	750	—25	—
Do. do. Pref. Ord.	,,	8	8	122½	—	6 10 9
Brazil Traction	£100	8	—	16	—	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	96½	—	5 3 3
London & Sub. Trac. 5% Pref.	£1	Nil	Nil	11/6	—6d.	—
London United Tram Deb.	Stock	4	4	60½	—1	6 12 3
Mexico Trams, 5% Bonds	—	5	5	27½	—4	18 3 8
Mexican Light Common	£100	Nil	Nil	25	—	—
Do. 7% Pref.	£100	7	7	50½	—	13 17 2
Do. 1st Bonds	—	5	5	57½	—5	8 13 10
Victoria Falls Ord.	£1	15	15	57/6	—	5 4 4
Yorkshire (West Riding)	£1	Nil	Nil	6/3	—	—
MANUFACTURING COMPANIES						
Assoc. Elec. Ord.	£1	6	6	19/6	—6d.	6 3 0
Do. Pref.	£1	8	8	28/3	—	5 12 3
Babcock & Wilcox	£1	15	14	42/–	—	*6 13 4
British Aluminium Ord.	£1	10	10	25/–	+6d.	8 0 0
British Insulated Ord.	£1	15	15	2½	—⅛	6 0 0
Brush Ord.	Stock	10	5	60	—	8 5 0
Callenders	£1	15	15	2⅛	—	6 6 4
Do. 6½% Pref.	£1	6½	6½	26/3	—	4 19 1
Crompton Parkinson Ord.	£5/–	30	30	1	—	7 10 0
Do. 8% Pref.	£1	8	8	28/3	—	5 13 3
Edison-Swan 1st Pref.	£1	7½	7½	22/9	—6d.	6 11 10
Do. 5% Deb.	Stock	5	5	92½	—	5 8 1
Electric Construction	£1	5	Nil	10/–	—	—
Enfield Cable Ord.	£1	25	25	3⅛	—	6 8 10
English Electric	£1	Nil	Nil	5/–	—	—
Do. do. Pref.	£1	Nil	Nil	5/–	—	—
Ferranti Pref.	£1	7	7	20/3	—3d.	6 18 3
G.E.C. Pref.	£1	6½	6½	25/–	—6d.	5 4 0
Do. Ord.	£1	14	10	39/6	—6d.	5 1 3
Henley	£1	30	30	4¼		6 10 5
Do. 4½% Pref.	£5	4½	4½	4⅜	—	5 2 10
India-Rubber	£1	Nil	Nil	4/6	—	—
Johnson & Phillips	£1	10	10	28/9	—	6 19 2
Siemens Ord.	£1	7½	7½	20/–	—	7 10 0
Telegraph Construction	£12	10	7½	10	—½	9 0 8

* Dividends paid free of Income Tax.

The Situation in Chile

The position of British electrical traders in a variable market

A REPORT on economic conditions in Chile in 1930 by Mr. E. Murray Harvey, H.M. Commercial Secretary at Santiago de Chile, has been issued by the Department of Overseas Trade (Stationery Office, price 3s. net). There is much in the report to explain why Chile has been unable to withstand the effects of the world-wide depression. In 1930, for the first time for many years, Chilean foreign trade showed an adverse balance, largely because of the low prices obtained for three of the country's staple products, namely nitrate, copper, and wool. At the same time, although there was a good exportable surplus of grain, little or none could be sold for shipment.

The steps which the Chilean Government took to deal with the situation included the granting of a bounty on the export of grain, the conversion of all railway station sheds into public grain stores, the introduction of drastic economies in the public services, and the restriction of expenditure on new constructional work, and last, but not least, the rationalisation scheme in connection with the nitrate industry.

It should be added that the last-named scheme, which resulted in the formation of the nitrate combine known as "Cosach," appears now to be somewhat in jeopardy owing partly to the opposition of the new Chilean Government and partly to the movement in Europe to restrict nitrate imports.

The Protection of Home Industry

At the same time a movement was initiated in favour of the further protection of the manufacturing industries, many of which are of such a nature that they could not be carried on without the shelter of a strong tariff wall. Among the arguments used by the protagonists of increased duties were the menace of unemployment, the assertion that foreign manufacturing countries were dumping their surplus production into Chile, the alleged advantage of restricting importation in order to restore the balance of trade, and the increase of revenue which it was said would result from increased customs receipts on the one hand, and by making it possible for local industry to pay more in taxation on the other.

The Society of Manufacturers prepared a schedule of articles which it maintained could be made in Chile of a quality sufficiently high to suit the country's needs, and it was successful in obtaining the raising of the customs duty on many of these by from 20 to 35 per cent. Further increases of duties have been made since Mr. Harvey's report was written. He remarks "It is very regrettable that among these articles were very many which have been important items of Great Britain's export to Chile and it thus happens that so far as can be judged it is British trade with Chile which will for the time being suffer more than that of any other country."

Summing up the general situation, the Commercial Secretary says that although Chile in the past has shown great powers of recuperation, her recovery will, it is to be supposed, not take place until the existing universal depression disappears.

Electrical Imports

The importation of electrical machinery, apparatus, and material reached the value of a million and a quarter pounds sterling during 1929. The United States, Germany, and the United Kingdom, in the order named, are, as usual, the principal countries of supply. The following table shows the values of the imports of electrical goods from 1923 to 1929, with the percentages supplied by the United States, Germany, and the United Kingdom, respectively :—

Year	Value in (£1,000)	Percentage from Supplying Countries: United States	Germany	United Kingdom
1923	814	39	34	20
1924	924	44	29	20
1925	791	47	26	19
1926	1,387	67	17	10
1927	791	50	22	22
1928	962	39	26	25
1929	1,279	44	23	21

Whilst the above table shows for 1929 a decrease in the shares of the United Kingdom and Germany, and an increase in that of the United States, this cannot be taken as being more than a general guide to the tendency of trade, and a single large installation contract carried out with materials derived principally from any one country will cause a marked fluctuation in the annual figures.

British Electrical Exports to Chile

The following table shows the values of the various classes of electrical machinery and equipment exported from this country to Chile during 1930, the previous year's figures being also given :—

	1929 £	1930 £	Inc. or dec. £
Wires and cables, rubber insulated	11,039	8,381	– 2,658
Ditto, other insulation	14,209	10,344	– 3,865
Ditto, telegraph and telephone	70,759	13,673	– 57,086
Radio apparatus	25,088	2,392	– 22,696
Telegraph and telephone apparatus	99,294	63,336	– 35,958
Stationary batteries	4,714	1,202	– 3,512
House service meters	5,628	7,643	+ 1,015
Unspecified electrical apparatus	8,817	32,432	+ 23,615
A.c. generators	3,206	6,689	+ 3,483
D.c. generators	4,642	1,172	– 3,470
A.c. motors	7,526	2,680	– 4,846
D.c. motors	5,104	1,111	– 3,993
Static transformers	6,381	2,149	– 4,232
Control and switchgear	12,927	10,399	– 2,528
Unspecified electrical machinery	5,507	5,240	– 267

The Competitive Situation

In commenting on the trade figures, Mr. Harvey says that there is great competition for a market which is small and keenly discriminating. The most up-to-date at the lowest price is essential. Old-established manufacturers, who were among those to develop the industry, maintain branch offices in Chile where technical advice and free "service" are given, and where all the most modern selling devices are used. The basis of sales is financial accommodation, and it is difficult if not impossible to sell in competition on a cash basis. Extended terms are exacted and obtained by municipalities, industrial and mining concerns, as well as by the small wiring contractor and the domestic user of electrical energy.

The electricity supply companies give long credit terms for electrical apparatus for domestic use and they have on occasion purchased entire stocks of cookers, heating appliances, &c., held locally by manufacturers' Chilean branches in order to meet sudden demands resulting from intensive advertising campaigns. There is a tendency to extend the period over which payments are made and already the larger initial payment has been reduced and even cut out in some cases.

The following comparative table shows the value and origin of some of the principal items of electrical material imported during 1929 :—

Article	Value (£1,000)	Percentage from supplying countries: United States	Germany	United Kingdom
Electric motors	132	50	31.0	5.0
Dynamos, transformers, &c.	92	60	22.5	9.0
Transmission cables	310	47	25.0	24.0
Electric lamps	92	26	41.0	7.0
Telegraph, telephone and radio apparatus	287	31	5.0	44.5
Batteries	105	69	16.0	6.0
Electric light and other apparatus	247	45	31.0	10.0
Silk-insulated wire	12	10	5.0	82.0

Telephone Developments

The Commercial Secretary reports certain changes in connection with the arrangements for telephonic communication in the country, which is now controlled by the International Telephone and Telegraph Corporation. The concession granted in May, 1924, at the time the service was under British control, has been replaced by a fresh contract providing for the formation this year of a new company to take over the local and long-distance services and to be administered by a board consisting of not more than 15 directors three of whom will be nominated by the Chilean Government. At the same time not less than 80 per cent. of the employés must be of Chilean nationality. Another provision of the contract is that within ten years the company shall complete the connection of the provinces from the northern (Peruvian) frontier to Puerto Montt and within a further five years extend the service to Puerto Aysen.

During 1930 international telephone services were opened and extended to all subscribers of the Cia. Chilena de Telefonos, operated at present by land line to Buenos Aires and thence by wireless by agreement with one of the associated companies of the International Telephone and Telegraph Corporation owning a radio station at Buenos Aires. There are two large international radio stations in Chile, both situated near the capital. That at Quilicura, erected in 1928, is a short-wave Marconi station operated direct from the Transradio Company's Santiago office, and it maintains telegraphic communication with all countries of the western hemisphere.

Broadcasting is carried on by three large stations owned and operated by the chief local daily newspapers, which can be used for advertising purposes, and by a number of smaller stations, most of which are situated in the capital.

Nocturnal Swimming Galas in Scotland

Swimming galas in surroundings illuminated by electric lighting are becoming a feature of the holiday season at Scottish coast resorts. Thousands of spectators recently attended a beautiful display given by the North Berwick Swimming Club at the Corporation Pond. The pond was brightly illuminated in colour by both floodlights and searchlights and the result was very effective. The display is to be repeated. An illuminated display and gala at Troon, on the Ayrshire coast, also attracted a large gathering, while the Rothesay illuminations, an annual event, proved a great success.

Swedish Electrical Imports

Statistics for 1929 and 1930 compared

THE following figures, showing the values of Sweden's imports of electrical and allied goods during 1930 are taken from the recently-published official trade returns. For purposes of comparison the figures for 1929 are given and notes of increases or decreases are made. Details of Sweden's electrical exports during 1930 appeared in our last issue (p. 340).

	Kron. Thous. 1929.	Kron. Thous. 1930.	Kron. Thous. Inc. or dec.
Accumulators and parts thereof—unmounted cells—			
Total	88	126	+ 38
From Germany	51	—	— 51
„ Great Britain	*	70	—
Accumulator plates—			
Total	566	132	— 434
From Denmark	22	6	— 16
„ Germany	420	71	— 349
„ Gr at Britain	33	31	— 2
„ U.S.A.	80	25	— 55
Cells and batteries, wholly or partly mounted—			
Total	670	970	+ 300
From Denmark	48	80	+ 32
„ Germany	2'5	450	+ 235
„ Great Britain	115	150	+ 35
„ U.S.A.	280	240	— 40
Special apparatus for electrical purposes: Röntgen ray apparatus—			
Total	233	370	+ 137
From Germany	216	290	+ 74
Wireless telegraph and telephone apparatus—			
Total	6,531	10,906	+ 4,375
From Germany	2,883	5,280	+ 2,397
„ Great Britain	476	970	+ 494
„ U.S.A.	57	190	+ 133
„ Holland	2,685	3,640	+ 955
Other special apparatus for electrical purposes—			
Total	6,9'0	7,105	+ 195
From Denmark	225	293	+ 68
„ Germany	3,740	3,200	— 540
„ Great Britain	1,980	2,260	+ 330
„ Switzerland	120	580	+ 460
„ U.S.A.	445	530	+ 85
Galvanic cells—			
Total	3,195	3,190	— 5
From Denmark	1,780	1,550	— 230
„ Germany	1,310	1,530	+ 220
Vacuum cleaners—			
Total	376	490	+ 114
From Germany	330	432	+ 102
Generators and motors, weighing not more than 500 kg. each—			
Total	3,840	2,570	— 1,270
From Denmark	156	80	— 76
„ Germany	2,550	1,545	— 1,005
„ Great Britain	211	145	— 66
„ U.S.A.	646	610	— 36
Ditto, 500-3,000 kg.—			
Total	602	690	+ 88
From Denmark	75	80	+ 5
„ Germany	380	485	+ 105
„ Great Britain	26	50	+ 24
Ditto, over 3,000 kg.—			
Total	187	380	+ 193
From Germany	122	340	+ 218
Transformers, 100-500 kg.—			
Total	72	320	+ 248
From Germany	45	67	+ 22
„ Great Britain	*	153	—
Transformers, 500-3,000 kg.—			
Total	53	140	+ 87
From Germany	33	96	+ 63
Transformers, over 3,000 kg.—			
Total	170	450	+ 280
From Germany	140	220	+ 80
„ Switzerland	30	175	+ 145
Metal-filament lamps—			
Total	3,716	3,330	— 386
From Denmark	112	130	+ 18
„ Germany	2,745	2,240	— 505
„ Netherlands	337	450	+ 113
„ Austria	56	80	+ 24
Insulating tubes— Total (nearly all from Germany)	410	388	— 22
Carbon, not specially mentioned, for electrical purposes, weighting 3 kilos or more—			
Total	1,812	1,295	— 517
From Germany	936	520	— 416
„ U.S.A.	857	750	— 107
Carbon brushes—			
Total	247	220	— 27
From Germany	38	30	— 8
„ Great Britain	174	150	— 24
Carbon: Other kinds—			
Total	125	170	+ 45
From Germany	103	80	— 23
„ U.S.A.	6	30	+ 24
Starting, regulating, and reduction resistances, controls, and other electric regulators—			
Total	660	562	— 98
From Germany	507	410	— 97
Stators, rotors, current collectors, magnet coils, &c., weighing not more than 50 kilos—			
Total	330	460	+ 130
From Denmark	27	60	+ 33
„ Germany	195	330	+ 135
Current interrupters and reversers, oil-break, box, knife and other switches—			
Total (largely from Germany)	2,030	3,130	+ 1,100
Safety appliances, not specified—			
Total	846	860	+ 14
From Germany	825	823	— 2
Electricity meters—			
Total	1,284	1,390	+ 106
From Germany	1,135	1,220	+ 85
„ France	97	100	+ 3
Other electrical measuring instruments—			
Total	818	810	— 8
From U.S.A.	71	90	+ 19
„ Germany	665	610	— 55
Cables and cords with sheaths of lead or other metal; maximum diameter 25 mm.—			
Total	1,208	1,276	+ 68
From Denmark	122	63	— 59
„ Germany	1,061	1,077	+ 16
Ditto, of greater diameter—			
Total	1,493	3,920	+ 2,427
From Germany	1,375	3,903	+ 2,528
Ditto, not specified—			
Total	1,390	1,370	— 20

(£1=about 18 kr.)

* Not specified.

An International Electrical Concern

A recent issue of the *Bulletin* of the British Chamber of Commerce for Italy contained an article on "Italian Hydro-Electric Activities" reviewing the annual report of the Italian hydro-electric holding company, the Società Adriatica di Elettricità. This company is actively expanding its business relations abroad. In 1930 the European Electric Corporation, Ltd., was organised under its auspices in Montreal (Canada); it has large investments in the Compagnie Europ'enne pour Entreprises d'Electricité et d'Utilité Publique; and in the Compagnie Italo-Belge pour Entreprises Electriques, which is the technical organ for the activities of the group in a whole series of countries in Central and Eastern Europe. In May, 1930, it formed the Iberian Electric with head offices in Montreal and offices in Madrid, which takes an important part in the major electric power enterprises in Spain such as the Madrid Electric Union, the Barcelona Traction, the Sociedad Saltos del Alberche, and above all, jointly with the Banco de Bilbao group, the General Electric Company and the Banca Rollins, it participates in the activities of the Sociedad Hispano-Portuguesa de Transportes Eléctricos Saltos del Duero, which is erecting on the banks of the Esla, an affluent of the Duero, the largest hydro-electric power station in Spain with a potential output of 450 million kWh, which will supply power to one-fourth of the Spanish Peninsula.

Another enterprise which has arisen with the active participation of the Adriatica Elettricità is the Galileo Société Hellénique d'Electricité, founded in Athens in April, 1930, with the participation of British and Greek groups. It has completed plans for erecting the first hydro-electric power station in Greece on the Lake of Stinfalia, 100 km. from Athens, and has taken over the management of some minor power stations in that country.

In June, 1930, the British and International Utilities, Ltd., was formed in London, with the participation of the Adriatica and its affiliated companies. This concern is interested in the plans for the electrification of the agricultural districts of Lincolnshire, a scheme which offers the opportunity for important co-operation in the development of electric power works in England.

Correspondence

Faraday's Galvanometer

In common with probably all your readers, I have read with great interest the very fine article in the REVIEW of August 28th on Michael Faraday.

Without the galvanometer, however, it would seem that his epoch-making experiments would have been difficult. Now, it seems to me that a galvanometer is essentially an electro-magnetic piece of apparatus. Could not Faraday have deduced a great deal from the action of this instrument, and is not some credit due to its inventor? It is possible that I am wrong in assuming that the galvanometer was "invented," perhaps it was merely by chance that the deflection of a compass needle was noticed when in proximity to a coil of wire carrying current, in which case it would be a short step to combine the two components in one instrument. Again, however, this seems to point to a connection between magnetism and electricity.

If it is not wasting your space, the views of other readers would be interesting at this period. May I again congratulate you on your very fine article on Faraday?

VERE B. BURGOYNE.

London, E.C.4, *September 3rd*, 1931.

[Our correspondent raises a point that many of our readers will consider of interest. Professor E. W. Marchant has kindly amplified his remarks in the letter reproduced below.—EDS. ELEC. REV.]

The galvanometer that Faraday used was, of course, a very essential part of his apparatus. The action of an electric current on a compass needle was described by Oersted in July, 1820, and was one of the most important experiments in the history of electro-magnetism. A very good account of this work has been given in a book called "Pioneers of Electrical Communication," by Mr. Rollo Appleyard.

Oersted had thought that there must be some connection between electric currents and magnetism, and, after lecturing to his class of students one day, asked them if they would care to remain behind to see an experiment which he was making. He had a wire through which he passed an electric current from a battery and near this was a compass needle; when the current was switched on the compass needle moved slightly. At first he thought that this was due to capricious disturbances. He was perplexed by the movement of the pole in a direction at right angles to the direction of flow of current in the wire. Later he returned to the investigation and obtained definite results. It is difficult to over-estimate the importance of this observation, and it was, of course, the basis of the galvanometer which Faraday used.

E. W. MARCHANT.

Liverpool, *September 5th*, 1931.

Shoddy Wiring

I should like to obtain the opinions of your readers on some of the wiring installations I have come across recently. I have seen houses wired with c.t.s. fixed to the walls by huge staples, and joints put under floor boards that are really disgraceful pieces of work. No firm would supply cable to be used in that manner, but, as the plaster is on the walls by now, perhaps what the eyes don't see won't be worried about. The contract price for the work was 7s. 6d. per point, including shade. In one case the meters and other equipment were fixed only 2 ft. 6 in. above the floor level.

It must be remembered that we electricians have a moral responsibility towards those we expose to risks, especially children.

What I should like to know is why cannot the supply authorities or the Electricity Commissioners take action in such cases? Surely the time has now come when all electricians should be obliged to hold a certificate after a suitable examination, which certificate could be withdrawn from men forgetful of their obligations towards the community.

SAFETY FIRST.

September 6th, 1931.

[The supply authorities have very little power to refuse to connect bad wiring, provided the installation passes a somewhat primitive test. West Ham Corporation is, as far as we know, the only undertaking possessing full legal powers in this respect.—EDS. ELEC. REV.]

The Application of Induction Regulators

Mr. V. C. Bryan's article on the above subject, in your issue of the 28th ult., appears to give a misleading impression regarding the power-factor characteristics of the ordinary (or single-wound) three-phase regulator, as compared with the double (or twin) three-phase regulator and the star-connected bank of single-phase regulators.

The inherent principle of operation of the single-wound three-phase regulator does not involve a difference in power factor between the incoming and outgoing sides; neglecting magnetising current and internal impedance, the line voltage phase-shift is accompanied by an equal phase-shift in the line current; hence, any power factor difference between the two sides is occasioned merely by magnetising current and internal impedance, exactly as in the double-wound three-phase regulator and the star-connected bank of single-phase regulators.

The advantage of the latter two forms of regulator, as compared with the single-wound three-phase type, lies in the fact that they do not depend for their operation on the introduction of voltage phase-shift between incoming and outgoing sides, and hence are suitable for use in the control of parallel circuits.

Old Trafford, Manchester. D. FIRTH.

September 2nd, 1931.

Radial Distribution

At the present time many undertakings are having to make drastic changes in their high-voltage distribution systems to enable them to cope with load developments and also to permit connection to the grid network. The opportunity occurs therefore to consider the question of standardising a radial system of high-voltage distribution or secondary transmission.

The radial system has many advantages over the more usual interconnected system due to its greater simplicity, the ease with which it can be protected, and a reduction in kVA liberated under short-circuit conditions.

In spite of these advantages, the radial system has not been popular hitherto, owing to its uneconomical use of copper, but now that the amounts of power to be distributed, transmitting distances, and the areas of distribution have increased, the relative importance of the cost of copper has been automatically reduced.

The importance of splitting up the system so that the short-circuit kVA is a minimum is in many cases the predominating factor to-day, influenced as it is by the interconnection of all power stations through the grid. Furthermore, the importance of continuity of supply is greater than it ever was, and it is therefore necessary to adopt a system that combines extreme simplicity with ease of protection.

A further advantage of the general adoption of the radial system is that it would enable standard distribution units to be used, which would reduce the number of spares and cheapen cost. In America, standard equipment on the lines suggested has been developed and can be obtained at very short notice; it comprises two on-load tap-charging transformers and four or six low-voltage outgoing distributor oil switches.

Quite apart from the monetary advantages to the individual undertaking of developing with standardised units—and I know of one undertaking in this country that has saved thousands of pounds through the adoption of the radial system—some uniform method will have to be adopted sooner or later. Although the present is a time of financial stringency, I submit that this aspect should not be overlooked, else conditions will arise in a few years similar to those that necessitated the construction of the grid network, and the cost of the change will, by that time, have very greatly increased.

London, S.E.7. D. GRINLEY.

September 5th, 1931.

Hydrogen Cooling for Electrical Plant

The use of hydrogen as a cooling medium has now passed from the development stage to commercial application. The system is chiefly used in the United States in conjunction with large outdoor synchronous condensers, but it is also used there and on the Continent in connection with indoor apparatus such as large alternators, the rating of which can be increased to 1.33 times normal, based on the temperature rise.

The risk of explosions due to the ignition of mixtures of hydrogen and air inside the machine has been eliminated by preventing the formation of mixtures of dangerous proportions, and the enclosing casing is designed to stand an internal pressure of 100 lb. per sq. in.

The change from hydrogen to air when access to the interior of the machine is necessary is done by scavenging the hydrogen out of the casing with an inert gas, CO_2, which flows from bottles, in which it is contained under pressure, to the bottom of the machine, the process being reversed when hydrogen has to be admitted. The percentage of gas allowed is 95 to 98 of hydrogen. Gas-changing operations are controlled by a mechanically operated valve.

The closed circuit system is used for the circulation of the gas; fans are mounted on the rotor shaft, the gas circulates radially from the stator inwards to the rotor and then through the fan again. Water coolers may be mounted inside the machine casing if required. The internal pressure in the machine casing is maintained above atmospheric pressure so as to prevent the ingress of air. Hydrogen automatically enters, during operation, to make up any leakage, and alarms are fitted to give warning if either the internal pressure or the hydrogen content falls below requirements.

The initial gas pressure from the storage bottles is 2,000 lb. per sq. in., a reducing valve being used to obtain a uniform secondary pressure of 15 lb. per sq. in. An automatically operated relief valve which permits the gas to escape at 50 lb. is fitted to prevent a dangerous pressure internally in case the reducing valve should leak. All the gas is passed through a calcium-chloride dryer before entering the machine.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1930

3,905. "Apparatus for carrying out chemical reactions with the aid of electric discharges." J. Y. Johnson (I. G. Farbenindustrie Akt.-Ges.). February 5th, 1930. (354,735.)

4,331. "Vacuum tube devices." A. E. White (Arcturus Radio Tube Co.). February 8th, 1930. (354,737.)

9,082. "Electromagnetic relays." Coventry Automatic Telephones, Ltd., and J. Eriksen. November 14th, 1930. (354,847.)

10,764. "Electric switches." F. Holden and Measurement, Ltd. April 4th, 1930. (354,708.)

11,599. "Apparatus for distant electrical control." Sleeper Research Laboratories Inc. April 11th, 1929. (354,749.)

11,788. "Electric discharge lamps." General Electric Co., Ltd., and J. W. Ryde. April 14th, 1930. (354,780.)

13,857. "Adjustable electrical resistances or inductances." W. J. Harris. May 6th, 1930. (354,754.)

14,058. "Electric motors." Siemens-Schuckertwerke Akt.-Ges. June 6th, 1929. (354,809.)

14,187. "Alternating-current electrical instruments." Aron Electricity Meter, Ltd., E. W. Hill, A. White, and E. J. Riordan. May 8th, 1930. (354,759.)

14,223. "Ignition systems for internal-combustion engines." G. Leiva. May 8th, 1930. (354,715.)

14,557. "Electric motor driving mechanisms for valves and other devices." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). May 12th, 1930. (354,813.)

14,577. "Automatic switching systems for balancing direct-current electric circuits." British Thomson-Houston Co., Ltd. May 10th, 1929. (354,730.)

14,625. "Submarine signalling cables." Electrical Research Products, Inc. May 18th, 1929. (354,734.)

14,741. "Radiography." British Thomson-Houston Co., Ltd. May 13th, 1929. (354,768.)

14,811. "Alternating-current bridges." Standard Telephones and Cables, Ltd., and N. P. Nielsen. May 14th, 1930. (354,788.)

14,812. "Submarine cable transmission systems." Standard Telephones & Cables, Ltd., T. S. Skillman, and A. H. Roche. May 14th, 1930. (354,789.)

14,813. "Telephone and like transmission systems." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). May 14th, 1930. (354,790.)

14,940. "Electric signalling arrangements adapted to be used in telephone systems." Siemens Bros. & Co., Ltd., and D. A. Christian. May 15th, 1930. (354,821.)

15,477. "Transportable electricity prepayment meters." E. J. Libby and Associated Electrical Industries, Ltd. May 20th, 1930. (354,850.)

15,486. "Television systems." Electrical Research Products, Inc. June 26th, 1929. (354,853.)

15,549. "Telephone systems." Associated Telephone and Telegraph Co. June 3rd, 1929. (354,858.)

15,600. "Television systems." Marconi's Wireless Telegraph Co., Ltd. June 11th, 1929. (354,863.)

15,678. "Electric switches with arc extinction by self-generated vapour." Siemens-Schuckertwerke Akt.-Ges. July 16th, 1929. (354,866.)

15,782. "Electrical heating apparatus for cooking and other domestic purposes." J. Tanaka. June 8th, 1929. (354,869.)

15,828. "Electric switches with arc-extinction by self-generated vapour pressure." Siemens-Schuckertwerke Akt.-Ges. August 20th, 1929. (354,873.)

15,842. "Electric switches with arc extinction by self-generated vapour pressure." Siemens-Schuckertwerke Akt.-Ges. August 20th, 1929. (354,874.)

16,361. "Electric switches with arc extinction by self-generated vapour pressure. Siemens-Schuckertwerke Akt.-Ges. June 18th, 1929. (354,890.)

16,362. "Electric switches with arc extinction by self-generated vapour pressure." Siemens-Schuckertwerke Akt.-Ges. August 29th, 1929. (354,891.)

16,914. "Retarding-mechanism for electric switches." General Electric Co., Ltd., and W. Wilson. May 31st, 1930. (354,899.)

17,121. "Station indicator for use with wireless sets, televisors, and the like, employing frame aerials." C. G. Philp. June 4th, 1930. (354,902.)

17,376. "Submarine signalling-apparatus." W. L. Walker. June 5th, 1930. (354,903.)

17,602. "Luminous tubular electric signs." F. H. Wingrave. June 6th, 1930. (Addition to 327,963.) (354,908.)

17,774. "Electric switches." G. H. Ide and H. L. Bentley. June 10th, 1930. (354,911.)

17,778. "Electric heaters of the thermal-storage type." F. Sauter and L. G. A. Sims. June 10th, 1930. (354,912.)

18,258. "Road-traffic regulating or signalling apparatus." Revo Electric Co., Ltd., F. H. Reeves, and A. Crawford. June 14th, 1930. (354,920.)

19,002. "Mounting means for the heating-elements of electric resistance furnaces." Hevi Duty Electric Co. June 22nd, 1929. (354,928.)

19,476. "Speed controllers for electric motors." Igranic Electric Co., Ltd. (Cutler Hammer Manufacturing Co.). June 26th, 1930. (354,933.)

19,528. "Electric switches." G. H. Ide and H. L. Bentley. June 27th, 1930. (354,935.)

19,778. "Anodes for electroplating." Udylite Process Co. November 13th, 1929. (354,939.)

20,913. "Transmission and reception of pictures." British Thomson-Houston Co., Ltd. August 20th, 1929. (354,953.)

20,999. "Driving systems of Ferraris measuring instruments, more especially of electricity meters." Landis & Gyr Soc. Anon. August 24th, 1929. (354,954.)

21,061. "Devices for suspending electric conductors." British Thomson-Houston Co., Ltd. July 11th, 1929. (354,955.)

21,644. "Electric tramway or railway vehicles." Electro-Mechanical Brake Co., Ltd., and G. N. Cadbury. July 17th, 1930. (354,972.)

21,871. "Illuminated traffic-control signals." Chance Bros. and Co., Ltd., J. H. Abbink-Spaink, and W. M. Hampton. July 19th, 1930. (354,976.)

22,080. "Electric switches of the fluid-flow type." British Thomson-Houston Co., Ltd. July 27th, 1929. (354,983.)

22,378. "Electric control switches." C. T. Evans. October 28th, 1929. (354,989.)

22,478. "Electrically-heated clothing and the like." B. Sykes. July 25th, 1930. (354,991.)

22,615. "Electric cable joints." W. W. Triggs (Ohio Brass Co.). July 26th, 1930. (354,994.)

23,591. "Systems of electric motor control." British Thomson-Houston Co., Ltd. August 9th, 1929. (355,006.)

23,725. "Machine set or group comprising a prime mover and an electric generator." Siemens & Halske Akt.-Ges. August 29th, 1929. (355,009.)

23,824. "Protective connections with excess current and direction relays." Siemens & Halske Akt.-Ges. August 10th, 1929. (355,013.)

24,360. "Apparatus for the production of sound, such as loud-speakers." General Electric Co., Ltd., G. C. Marris, and D. A. Oliver. August 14th, 1930. (355,024.)

24,511. "Electric switches." British Thomson-Houston Co., Ltd. August 16th, 1929. (355,026.)

25,052. "Supersonic heterodyne wireless receiving systems." Gramophone Co., Ltd., and A. G. D. West. August 21st, 1930. (355,035.)

25,854.—Machines for feeding and locating contact pins for attachment to the bases of vacuum electric tube devices and the like." Westinghouse Lamp Co. August 31st, 1929. (355,040.)

26,375. "Electric vacuum cleaners." V. A. Mattick. September 4th, 1930. (355,046.)

26,377. "Electrical tumbler and other switches, bell-pushes and the like." J. A. Crabtree. September 4th, 1930. (355,047.)

26,932. "Electrical measuring instruments." Evershed and Vignoles, Ltd., and G. F. Tagg. September 9th, 1930. (355,054.)

27,158. "Method of and apparatus for producing moulded bases or caps of the pin type for thermionic devices, electric discharge devices, incandescent lamps, and the like." British Thomson-Houston Co., Ltd. September 11th, 1929. (355,058.)

27,363. "Electric switches of the tumbler type." Wandsworth Electrical Manufacturing Co., Ltd., T. Batchelor, and A. B. Smith. September 13th, 1930. (355,063.)

27,552. "Dynamo-electric machines." Siemens-Schuckert-Akt.-Ges. October 11th, 1929. (355,066.)

27,692. "Synchronoscopes." British Thomson-Houston Co., Ltd. September 16th, 1929. (355,067.)

27,928. "Electric induction motors." J. W. Swendsen. September 19th, 1929. (Addition to 6,240/30.) (355,071.)

29,185. "Electricity meters with differential driving-gear." Landis & Gyr Soc. Anon. October 9th, 1929. (355,084.)

29,725. "Electric communication cables." W. T. Henley's Telegraph Works Co., Ltd., and W. P. Whitehouse. October 4th, 1930. (355,087.)

30,901. "Telemetering systems." British Thomson-Houston Co., Ltd. October 16th, 1929. (355,097.)

32,058. "Condensers." Marconi's Wireless Telegraph Co., Ltd. October 24th, 1929. (355,105.)

32,910. "Apparatus for making galvanic dry cells." Britannia Batteries, Ltd. (Accumulatoren-Fabrik Akt.-Ges.) November 1st, 1930. (355,118.)

1931

387. "High-frequency signalling systems." Telefunken ges. für Drahtlose Telegraphie. January 3rd, 1930. (355,164.)

1,049. "Talking-film installations." Naamlooze Vennootschap Philip's Gloeilampenfabrieken. February 21st, 1930. (355,166.)

2,306. "Telephone pay-stations." Telephon-Apparat-Fabrik E. Zwietusch & Co. Ges. March 14th, 1930. (355,168.)

5,045. "Electric lamps." General Electric Co., Ltd. May 16th, 1930. (355,173.)

5,289. "Electric lamps." General Electric Co., Ltd. May 16th, 1930. (355,175.)

5,933. "Motion picture sound apparatus." British Thomson-Houston Co., Ltd. February 25th, 1930. (355,177.)

6,222. "Guide and contact vice, particularly applicable to electrical upsetting-machines." Soc. Anon. Gatti & Giacchina. February 28th, 1930. (355,179.)

6,241. "High-frequency electrical apparatus." British Thomson-Houston Co., Ltd. February 28th, 1930. (355,180.)

8,512. "Switching arrangements for telephone systems." Telefonaktiebolaget L. M. Ericsson. March 21st, 1930. (355,181.)

8,513. "Switching arrangements for telephone systems." Telefonaktiebolaget L. M. Ericsson. March 21st, 1930. (355,182.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from September 2nd :—

Ultrascope. No. 523926. Class 8. Wireless telephonic and telegraphic receiving and transmitting apparatus and their parts, telephones, loud-speakers, and condensers, etc.—Ultra Electric, Ltd., Ultra Works, Erskine Street, N.W.3.

Ten Pas. No. 524275. Class 8. Electrical pick-ups, loud-speakers, and parts thereof, &c.—Neufeldt & Kuhnke Gesellschaft, Ravensberg Werk, Kiel, Germany (British representative, Harold Baron, Thanet House, 231, Strand, W.C.2.).

SES (lettering and design). No. 523373. Class 16. Electrical insulators and insulating parts of electrical apparatus, all being goods made of porcelain or earthenware. No. 523374. Class 50. Goods for use in electric lighting, heating, signalling and power installations, and made wholly or mainly of moulded non-current-conducting material, namely, non-conducting parts and accessories of the following: Switches, switch and socket combinations, switch and fuse combinations, cut-outs, fuses, plug and socket couplings, adaptors, lamp holders, ceiling roses, bell pushes, wall boxes and fuse boxes.—Simplex Conduits, Ltd., Simplex Works, Garrison Lane, Birmingham.

McLary (lettering and design). No. 521154. Class 18. Stoves and furnaces, and electric cooking stoves.—General Steel Wares, Ltd., 2355 Delisle Street, Montreal, Canada (British representatives, Dicker, Pollak & Mercer, 20-23, Holborn, E.C.1).

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Houses (2,400); city engineer.

Accrington.—Houses (24), Richmond Hill estate; borough surveyor.

Bentley-with-Arksey (YORKS).—Houses (96) for the U.D.C.; surveyor.

Bexhill-on-Sea.—Rebuilding business stores, 14, Devonshire Road, for Boots, Ltd., Nottingham.

Birkenhead.—Houses, Prenton Road East; H. C. Davies. Development, Manor Hill estate; T. T. Wainwright & Son. Additions, girls' high school, Grosvenor Place; governors.

Blackburn.—Houses (376), Longshaw site, for the B.C.; H. M. Webb, borough engineer, Town Hall.

Blackpool.—Houses (300), Lewton Park estate; borough engineer.

Blyth.—Slum clearance scheme; L. Leeper, surveyor, Seaforth Street.

Bolton.—Development of Shiptons estate; exors. of E. P. Ormond.

Burgess Hill (SUSSEX).—Houses (20) for the U.D.C.; surveyor.

Burnley.—Administrative block at Crown Point Smallpox Hospital; clerk to the Burnley Joint Hospital Board.

Canterbury.—Masonic library; F. G. Hayward, architect, Market Square, Dover.

Cheltenham.—Theatre at Winter Gardens; A. W. Martyn and H. T. Rainger.

Chilvers Coton (WARWICKSHIRE).—Schools (£3,000); trustees, Wesleyan Reform Union Church.

Clayton-le-Moors.—Houses (24), Oakenshaw; surveyor to the U.D.C.

Colwyn Bay.—Abattoir; U.D.C. surveyor.

Crabwood.—Extensions, small-pox hospital, for the Hampshire C.C.

Crewkerne.—Houses (20), Severalls housing estate, for the U.D.C.

Croydon.—Houses (128), Waddon estate, for the T.C.; borough engineer.

Dalkeith.—Hall. Edinburgh Road; secretary, Local Branch, British Legion.

Dartford.—Houses (128), Heath estate; U.D.C. surveyor. Shops, High Street; Boots, Ltd. Extensions, Livingstone Hospital; A. Bryans, builder, Kemsing, Sevenoaks.

Darwen.—Senior school, Manor Road; secretary to the Education Committee.

Devonshire.—Enlargement of senior school, Hatherleigh; county architect, Exeter.

Doncaster.—Stores, garages, offices, &c., Marsh Gate, for the T.C.; F. O. Kirby, borough engineer.

Eastbourne.—Houses (124) for P. & G. Attfield, Kingston Road; P. D. Stonham & Son, architects.

Fishguard.—Abattoir; Fishguard and Goodwick Councils.

Garstang.—Houses (10), Kettle Lane, for J. Cook.

Glamorganshire.—Alterations to Cowbridge, Mountian Ash, and Pontardulais schools; H. Rowland, clerk of the C.C., County Hall, Cardiff.

Glasgow.—Church, Shettleston, for Apostolic Church (Scotland); the minister. Additions to the Rosevale Cinema, Dumbarton Road; the manager. Three-storey hostel (£25,000) for The National Committee for the Training of Teachers; principal, Jordanhill College. Installation of electric lighting at the new Central Tabernacle, George Street; Scottish Protestant League. Shops, Meadowell Road and Amulree Street; Matthew Martin. School clinic, Gorbals, for the E.C. Extensions, High School of Glasgow (£82,500), for the E.C. Extensions, St. Roch's School (£30,000); education director and trade contractors.

Glossop.—Extensions to West Central School; Geo. Faulds, borough surveyor, Municipal Buildings.

Godstone (SURREY).—Houses (24), Oxted, for the R.D.C.; surveyor, Lloyds Bank Chambers, Oxted.

Hartismere (EYE).—Houses (56) for the R.D.C.; surveyor.

Helsmley.—Police station; Moody Bros., Northallerton.

Hetton-le-Hole (DURHAM).—Houses (40) for the U.D.C.; F. W. Goodyear, G. W. Sparrow, and G. Pearson, builders.

Hoddesdon (HERTS).—Houses (34) for the U.D.C.; W. Plumpton, surveyor.

Irish Free State (BRAY, Co. WICKLOW).—Technical schools for Vocational Education Committee; Jones & Kelly, architects, 17, South Frederick Street. (DUBLIN).—Building and other works at Nunciature, Phœnix Park, for Board of Works; T. Cassidy, secretary, Public Works Office. (LONGFORD).—Houses (24) for the U.D.C.; V. Kelly, architect, 87, Merrion Square, Dublin.

Kent.—Central school for girls, Bexley Heath; county architect, Maidstone.

Kilsyth.—Sewage disposal works; G. Thomson & Sons, chartered civil engineers, 164, Bath Street, Glasgow, C.2.

Lancaster.—Houses (50); borough engineer.

Lichfield.—Cinema, Tamworth Street; H. S. Scott, architect, King's Court, 115 and 117, Colmore Row, Birmingham.

Liverpool.—Bank and shops, Broadway, Norris Green; director of housing, Municipal Buildings, Dale Street.

London (GREENWICH).—Welfare centre and sunlight clinic, Chevening Road; borough engineer. (EALING).—Senior block for Stanhope School, for the E.C. (WIMBLEDON).—Re-erection of Sunlight Laundry, York Road and South Park Road, electrically equipped, for Loud & Western, Ltd.

Lower Gornal (WORCS).—Re-erection of Alexandra Picture House, for E. Jones.

Luton (BEDS).—Works extensions, for the Vauxhall Motors, Ltd.

Manchester.—Two elementary schools, Wythenshawe estate; education director.

Market Harborough.—Houses (50), Bye Pass Road; Coales & Green, architects.

Monmouthshire.—Schools, Bedwas, and conversion of new Tredegar Town Council School into central school, for the county E.C.; John Bain, architect, County Hall, Newport.

Motherwell.—Three hostels (£11,400), for the T.C.; burgh surveyor.

Newcastle-on-Tyne.—Extensions to offices, Grainger Street West; C. S. Errington, architect, 21, Grainger Street West.

New Malden (SURREY).—Extensions to factory premises at Burlington Road for the Decca Record Co., Ltd.; Gaze & Son, Ltd., builders, High Street, Kingston-on-Thames.

Newport (I. OF W.).—Housing scheme, Whippingham; borough engineer. Reconstruction of saw mills for H. W. Morey & Sons, Ltd.; H. & F. Damp, builders.

Norfolk.—Church, at Hindolveston; Buckingham & Berry, architects, Church Street, Sherringham, and Prince of Wales Road, Norwich.

Northampton.—Houses (180), Kettering Road estate; borough engineer.

North Riding.—Conversion of Pickering Poor Law Institution into children's home (£5,000), for the C.C.; county architect, County Hall, Northallerton.

Plymouth.—Houses (30), Vicarage Road housing estate, St. Budeaux, Devonport, for the C.C.; J. Wibberley, city engineer and architect, Sun Buildings. Heating mental hospital; T. J. R. Kierman, consulting engineer.

Prestwich.—Synagogue, King's Road, Sedgley Park; rabbi.

Prudhoe-on-Tyne.—Extensions to Prudhoe Colony for the Joint Public Assistance Committees of Northumberland and Durham; J. H. Morton & Sons, architects, Martin's Bank Chambers, Fowler Street, South Shields.

Renfrewshire.—Addition to Williamsburgh School, Paisley, for the C.C.; master of works, E.C.

Runcorn.—Schools, Latchford, for the R.C. managers; Rev. Father J. L. Cullen.

Salford.—Extension of Pendleton Girls' High School (£30,000); J. Hartley, director of education.

Sedgefield (DURHAM).—Houses (30) for the R.D.C.; surveyor.

Sheffield.—Telephone exchange, Woodseats; H.M. Office of Works.

Shipston-on-Stour (WORCS).—Houses (118) for the R.D.C.; surveyor.

Shoreham (SUSSEX).—Sewage works; Balfour and Son, engineers, 47, Victoria Street, London, S.W.1.

Southampton.—Cinema on the site of the "Regent," Shirley; A. C. Palmer, builders, Grange Road.

South Shields.—Additions to Harton Hospital, for the T.C.; J. P. Watson, borough engineer, Town Hall.

Stockton.—Municipal offices, Church Row, for the T.C.; Lanchester & Lodge, architects, 19, Bedford Square, London, W.C.

Stourbridge.—Extensions, Corbett Hospital; T. W. Edwards & Sons, builders, Audnam.

Stretford.—Alterations, Ashburton Road; Lloyds Bank Ltd.

Sunderland.—School buildings at the Thompson Memorial Hall, Monkwearmouth; Henderson Brothers, builders, Smith Street, South Shields. Extensions to Nursing Association Home, St. Agatha House; Randle, builders, Back Dunelm Street.

Sunniside (DURHAM).—Methodist church; S. James Stephenson, architect, 2, Saville Place, Newcastle-on-Tyne.

Taunton.—Market house extensions (£11,000); borough engineer.

Torquay.—Development, Collaton Shiphay estate; Mr. Banbury. Alterations and additions, Lincombe Hall Hotel, Woodfield Road; Lincombe Hall, Ltd. Alterations to old school, Braddons Road; Girls' Friendly Society.

Upton.—Houses (16) for the Hemsworth U.D.C.; W. T. Lynam, surveyor, Market Chambers, Hemsworth.

Wakefield.—Houses (200), Eastmoor estate; Corporation housing architect. Alterations and additions, Presbytery for the Canon Leteux; Newbald & Hartley. Works extensions for the Wakefield Express Services, Ltd., Southgate; Simpson & Moxon. Elementary school, Eastmoor estate, and extensions to Ings Road School and Lawefield Road School; city architect.

Wallasey.—Houses (100), Pasture Road estate, Moreton, for the T.C.; borough surveyor.

Whitby.—Church at Lealholm for the Rev. Michael Nealdon, St. Anne's Church, Ugthorpe, Egton Bridge, York; Robert Harrison, Glaisdale, North Riding.

Whitchurch (SALOP).—Houses (58) (£17,530); Geo. Edge, Son, & A. Davies, builders.

Willenhall (STAFFS).—Houses (116), Clothier estate, for the U.D.C.; surveyor.

Wincanton (SOMERSET).—Houses (71) for the R.D.C.; surveyor.

Worthing (SUSSEX).—Extensions, Durrington schools, for the borough E.C.; broough surveyor.

Wrexham.—Houses for the T.C.; G. F. Sumner, Ashfield, Stansty (70), and Herbert Hughes, Acrefair, houses (60) and flats, builders. Abattoir; borough engineer.